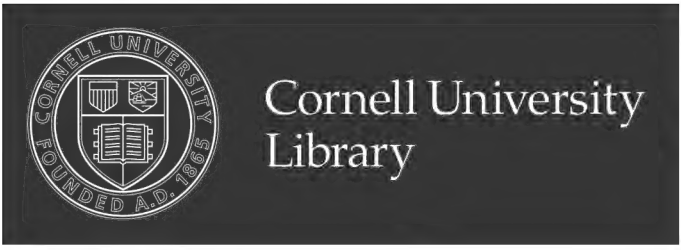

A

Contribution to the Bibliography

of the

Use of Sulphate of Iron in Agriculture

By

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CHICAGO . ILLINOIS

1906

FOREWORD

> "In some experiments on the action of green vitriol, or sulphate of iron, dissolved in water and used as manure, the results appear to vary exceedingly; some persons have not been able to discover that it produced the slightest effect, others have found it injurious, while a third class have declared they have derived a considerable benefit from the use of it."
>
> —*Thaer.*

THIS is the first of a series of publications on the use of Sulphate of Iron in Agriculture; beginning with the work of Thaer in Germany who first called attention in 1809 to the usefulness of Sulphate of Iron in Agriculture, and continuing to 1905.

The material is not colored in any way, it is an accurate record of work done. It will be published from time to time in the form of an author's index and subject index.

H.

CHICAGO, February 20, 1906

Weed Eradication by Spraying with Solutions of Sulphate of Iron.

THE IDEA of eradicating weeds by spraying fields with solutions of chemicals originated in France and was the result of observing that when grape vines were sprayed with solution of sulphate of copper and the spray accidently fell upon the common field mustard this plant was killed. This observation was made by Bonnet.†

M. Brandin demonstrated in field experiments the correctness of Bonnet's observation. M. Mantin in Pas de Calais made the claim that Sulphate of Iron gave better results than the sulphate of copper.

M. Duclos, Director of the Agricultural Station in Meaux, investigated the subject and compared the action of copper salts with Sulphate of Iron on field mustard, and found that a 1¼ per cent nitrate of copper worked the best, the mustard being destroyed while the grain remained unaffected. He showed that a 20 per cent solution of Sulphate of Iron completely eradicated wild mustard without injury to the grain, and that with a 40 per cent solution the grain was but slightly injured.

Experimenting with sulphate of copper and sulphuric acid in equal parts (2½ per cent solution), he found the mixture destroyed wild mustard and affected grain but slightly. That a 5 per cent solution of sulphate of copper alone destroyed wild mustard completely without injury to the grain; that a 10 per cent solution destroyed wild mustard completely and injured grain but slightly; that a 20 per cent solution while destroying the mustard injured the grain badly.

Finally M. Duclos recommends the following solutions, namely: 1¼ kgo. nitrate of copper to 1 hectolitre water (2¾ lbs. to 22 galls.); or, 30 kgo. of Sulphate of Iron to 1 hectolitre water (66 lbs. to 22 galls.); or, 2½ kgo. sulphate of copper,

† BONNET, L.—Le cuivre contre les ravenelles et les senes. Comice agricole de Reims, seance 12 Dec. 1896. Journal de Brabant-Hainaut, 1897, p. 521.

2½ kgo. sulphuric acid (5½ lbs. each to 22 galls.); or, 5 to 10 kgo. sulphate of copper to 1 hectolitre water (11-22 lbs. to 22 galls.

In 1897, in Germany, Schultz in Soest, began experimenting with Sulphate of Iron and recommended the practice to German farmers. He proposed using 600 litres of 15 per cent solution per hectare (64.2 galls. 15 per cent solution per acre.)

The following references show the development of the process :

ADERHOLD, R.—Ein paar Versuche zur Vertilgung des Unkrautes im Gartenrasen.

Centbl. Bakt. II Abt., Bd. VII (1901), S. 662.

ANDERSON, J. R.—Wild Mustard.

Dept. Agr. Brit. Columbia Bul. 11, p. 12. E. S. R. 15, p. 265.

Destruction of Brassica sinapistrum by spraying with S. of I. and S. of C.

BEHRENS, ( ).—(Experiments on Killing Weeds.)

Wochenblatt des Landw. Ver. im Grossherzogtum Baden (1902) No. 33.

Centbl. Agr. Chem., Bd. 33, S. 69.

Sulphate of Iron Successfully used on calcareous soils.

BÉNARD, J.—(Eradication of Weeds.)

Bul. du Comice agricole de Reims, Vol. 34 (1898).

For the eradication of weeds, used 5, 10 and 15 per cent solutions of S. of I. and found them inefficient. Twenty per cent solution efficient but less so than 2 per cent S. of C. solution.

BIEDENKOPF, H.—Zur Frage zur Bekämpfung des Hederichs, speziell durch metallsalzlösungen.

Deut. Landw. Presse, No. 46 (1901), S. 406.

Has made no study of what he writes, but thinks that no quantitative work has been offered on yield from sprayed *vs.* unsprayed plots. Thinks soil injured and plants poisoned.

VON BLÜCHER, ( ).—Hederichvertilgung.

Ann. Landw. der Mecklenburg Vereins (1903), No. 22.

BRANDIN, ( ).—La Destruction des Sanves.

Bul. Soc. Nat. Agr. France (1900), p. 451.

Experimented with 95 Hect. oats and 45 Hect wheat. Mustard apparently badly injured by 12 per cent solution but recovered to vigorous growth. Three and one-half per cent S. of C. destroyed completely.

BRÛLÉ, ( ).—(Eradication of Weeds by Spraying with Solutions of Metallic Salts.)

Comice agricole de l' arrondissement de Reims, 1898.

Claims that 5, 10, 15 per cent solutions are inefficient; that 20 per cent solutions are less efficient than a 2 per cent solution of sulphate of copper. It is necessary to employ solutions containing more than 25 per cent of Sulphate of Iron and these solutions rapidly corrode the apparatus.

CAMPBELL, J. R.—Report of the Spraying of Charlock and Runch.

Yorkshire Col. Leeds and East and West Ridings Joint Agri. Council Garforth Expts. (1899).

DE CÉRIS, A.—Le sulfate de fer pour la destruction des sanves.

Jour. Agr. Prat. (1900), T. II, pp. 40, 220.

Letter from M. Marguerite-Delarcholonny claiming discovery for the necessity of two sprayings.

DENAIFFE ET SIRODOT—(Destruction of Wild Radish and Wild Mustard).

L'Avoine, pp. 730-733.

Ten to twelve and half per cent solution S. of I. employed when plants are small, 15 per cent solution when plants are large. Applied at the rate of 12 Hktl. per Hect. Two reasons for using S.of I.—low cost and the favorable action on the growth of Oats.

DONHOFF, P.—Erfahrungen betr. Vertilgung des Hederichs und Ackersenfs durch Bespritzen mit Eisenvitriollösung.

Deut. Landw. Presse. (1902), S. 357.

DUCLOS, ( ).—Le destruction de la moutarde sauvage.

Bul. Soc. Nationale d'Agr. de France, 9 Juni, (1897).

Jour. Agr. Prat. T. I., (1897), p. 862.

DUSSERE, M. C.—Vertilgung des Unkrautes in Getreideäckern.

Jour. d'Agr. Suisse, No. 23, June 5, (1900).

The use of a 15 per cent solution of S. of I. in form of a spray did not give good results.

EDLER, ( ).—Zur Vernichtung des Wilden Senfs und des Hederichs.

Deut. Landw. Presse (1899), S. 267, 659. Jahres. Agr. Chem., Bd. 42, S. 352.

Solutions S. of I., 5-10 per cent strength, are useless. A 20 per cent solution is less efficaceous than 2 per cent solution Sulphate of Copper.

EHLERT, W.—Versuche zur Vernichtung von Hederich mit Eisenvitriollösung und Eisenvitriolpulver.

Korrespondenzbl. der Landw. kammer für die Provinz Ostpresussen, (1900).

Title not exact but descriptive.

FRANCK, ( ).—Hederichvertilgungsversuche in Fruhjahr, (1903).

Landw. Wchnschr. Sachsen 8, (1904), S. 62.

Experiments made with "Unkrauttod" (Sulphate of Iron). Applied in the early morning when dew is on the leaves. For uniform distribution the powder is not behind the solution. Applied by hand 50 pfd. per morgen. is used; by machine, 25 pfd. per morgen,

FRANK, ( ).—Beitrage zur Bekampfung des Unkrautes durch Metallsalze.

Arb. aus. d. Biol. Abt. d. Kair. Gesundamt. Bd. I, (1900), S. 127. Ztschr. Pflanzenkrank. Bd. XII, (1902), S. 188.

The destructive action of S. of I. and Sulphate of Copper on certain weeds is practically equal, hence the only question is that of cost.

The S. of I. is effective when used as a 15 per cent solution; the Sulphate of Copper at highest 5 per cent solution.

FREAR, WM.—Copperas or Vitrol as a Weed Killer.

Press Bull. Penn. Exp. Station.

FÜNFSTÜCK, W.—Die Hederich-Bekämpfung durch Bespritzen mit Salzlösungen resp. durch Jätemaschinen.

Deut. Landw. Presse, Bd. XXIX, S. 233.

Answer to Hillman.

FÜNFSTÜCK, W.—Auf welche Weise sind Hederich und Ackersenf in den Sommerkorn Saaten (Hafer, Gerste, Weizen) nach dem jetzigen Stande der Erfahrung in der Praxis rationell zu Vertilgungen?

Deut. Landw. Presse, Bd. XXIX, (1902), S. 165. Recommends a 20% solution Sulphate of Iron in quantities of 200 litres per morgen at most.

GERLACH, M.—Lässt sich durch Eisenvitriol Hederich Vertilgung ?

Jahresber. Vers. Stat. Posen, (1899-1900).
Jahresber. Agr. Chem., Bd. 43, S. 353.

Once spraying with 15-20 per cent solution of little use.

GRAFTIAU, J.—Le chimie et la lutte contre les mauvaises herbes armes nouvelles á la disposition des cultivateurs.

Ingén. Agr. Gembloux, An. 10, (1900), p. 413.

GRANDEAU, L.—Destruction de la cardamine des prés par le sulfate de cuivre. Nécessité de substituer le sulfate de fer au sel de cuivre.

Jour. Agr. Prat. T. I., (1900), p. 742.

Used a 15 per cent solution S. of I. for the destruction of Cardamine pratensis (Cuckoo Flower).

GRANDEAU, L.—Expériences nouvelles sur la destruction des Sanves.

Jour. Agr. Prat. (1900), T. I., p. 525. E. S. R. 12, p. 351.

Used 12½ per cent solution S. of I., 200 litres to acre, applied for the destruction of the weed in wheat fields. Destroyed Charlock, Mustard, Wallflower, Ground Ivy. Did not injure cereals, clover, colza and lupines

GUTZEIT, E.—Bekämpfung des Hederichs und der andern Unkräuter durch Eisenvitriollösung und Hederichtod.

Correspondensbl. d. Landw'kammer d. Provinz. Ostpreussen.

Ztschr. Pflanzenkrank. Bd. 12, S. 317.

GUTZEIT, E.—Feldversuche zur Bekampfung von Pflanzen krankheiten and Unkrautern.

Correnspondenzbl. d. Landw'kammer d. Prov. Oestpreussen.

Ztschr. Pflanzkrank. B. D. XI, S. 153.

A 15 per cent solution S. of L. destroys charlock and other weeds.

GWALLIG—Zur Vertilgung von Hederich und Ackersenf mit Eisenvitriol.

Deut. Landw. Presse No. 42 (1898) S. 463.

Seven to ten per cent solution of S. of I. will eradicatc charlock Stronger solutions injure barley, and in one instance barley was in-. jured by 7½ per cent solution.

HABERHAUFFE, M.—Über die Hederich vertilgung mittels Eisenvitriol.

Ztschr. Landw., Sachsen.

Fühlings Landw. Ztg., (1899), S. 238.

HAGLUND, E. & H. VON FEILITZEN—(Om ograesets utrotande genom besprutning med jaernvitriol.)

Svenska Mosskulturfor. Tidskr., 18 (1904), No. 6, pp. 413-420.
E. S. R. 16, p. 1091.

Preliminary experiments on moor soils showed that the spraying method furnishes an effective means of checking, if not killing, many weeds growing on such soils.

HANDTKE, ( ).—(Hederichvertilgung).

Ztschr. Landw'. Kammer. Prov. Schlesien, (1898), S. 999.

Lupiness and Serradella suffered injury.

HANSEN, J.—Anbauversuche mit verschiedenen Kulturpflanzen (Vertilgung des Hederich durch Verspritzen).

Deut. Landw. Presse, (1903), No. 1, S. 4.

Centbl. Agr. Chem., Bd. 33, S. 69.

A 15 per cent solution S. of I. gave very successful results.

HEINRICH, ( ).—Neue Mittel zur Vertilgung von Hederich und Ackersenf.

Deut. Landw. Presse, (1900), S. 666.

Use of fertilizers to be preferred to S. of I., e. g. Chilisaltpeter, Ammonium Sulphate, Chloride Potash (40 per cent).

HILLMANN, P.—Die Bekämpfung des Hederichs durch Bespritzung mit Salzlösungen.

Mitt. Deut. Landw. Gesell., 18, (1903), S. 80.

Jahresber. Agr. Chem. 46, S. 249.

Centbl. Agr. Chem., Bd. 32, S. 463.

A 15 per cent solution of S. of I. applied at the rate of 400-500 l. per hectare gave the best results. If dew is on the leaves the spraying will do no good. Clover is as little injured as cereals.

HILLMANN, P.—Die Ergebnisse der Umfrage betr. die Unkrautvertilgung.

Deut. Landw. Presse, Bd. XXIX, S. 416.

Use of molasses with S. of I. for plants with smooth leaves. A preliminary experiment with thistles apparently successful.

HILLMANN, P.—Die Ergebnisse der Umfrage Vetreffend die Unkrautvertilgung.

Jahrb. Deut. Landw. Gesell., (1902), S. 184.

HILLMANN, P.—Die Hederichbekämpfung durch Bespritzen mit Saltzlösungen.

Deut. Landw. Presse, Bd. XXIX, S. 214.

HILLMANN, P.—Die Bekämpfung des Hederich durch Bespritzen mit Salzlösungen.

Mitt. Deut. Landw. Gesell. (1903), No. 16, S. 80, 84.

HILLMANN, P. — Die Bekämpfung des Hederichs durch Bespritzen mit Salzlösungen.

Mitt. Deut. Landw. Gesell., (1902), S. 24.

Thistles injured but some recovered. Very few Clover plants killed, *i.e.*, Trifolium species. With Medicago species (Luzerne and Yellow Clover) more killed. Lupines blackened but not permanently injured.

HITIER, H.—Nouveau procédé de destruction de la moutarde sauvage.

Jour. Agr. T. I., (1897), p. 705.

HITIER, H.—Destruction des sanves.

Jour. Agr. Prat. T. I., (1899), pp. 98-160.

Duclos recommends two applications of a 15 per cent solution, or one application of a 20 per cent solution.

HITIER, H.—Destruction des sanves.

Jour. Agr. Prat., n. ser. 5 (1903), p. 658. E. S. R. 15, p. 266.

Should be sprayed when the young plants have developed two or three leaves only, for then the plants are easily killed with the use of a minimum amount of solution and with the least harm to the field by the horse and the spraying machine wheels.

HITIER, H.—Destruction des sanves.

Jour. Agr. Prat. (1899), T. II, p. 98.

Gives as the best time for spraying the time when the first four or five leaves are out and well opened.

HOFFMAN, M.—Vertilgungversuche von Ackerunkräutern.

Thüringer Landw. Ztg., (1903), No. 6.
Centbl. Agr. Chem., Bd. 33, S. 69.

S. of I. solutions worked the surest of all salts tried. Rape suffered by spraying.

HORNSBY, J. — Laxton Park Experiments on Charlock Spraying, 1899.

Agr. Gaz. (London), Vol. 50 (1899), p. 232. E. S. R. 11, p. 461.

On Barley fields 7½ to 10 per cent solutions. S. of I. applied at the rate of 32-40 galls per acre was not effective.

JSÖTING, ( ).—Die Vertilgung des Hederichs durch Bespritzen mit Eisen vitriollösung.

Sächs. Landw. Ztschr. (1900), S. 174.
Jahresber. Agr. Chem., Bd. 43, S. 352.

A 15 per cent solution S. of I. proved sufficient, though 20 per cent solution did no harm to Oats. The younger the Charlock, the easier it is destroyed.

JOURNEE, C.—Destruction of Charlock by Spraying with Solutions of Iron and Copper Sulphate.

Agronome, 1899, p. 435. E. S. R. 12, p. 351.

KEISER, ( ).—Zur Frage des richtigen Zeitpunktes zur Hederich-Vertilgung.

Nass. Landw. Ztschr. (1899), S. 252.

Charlock need not be sprayed with S. of I. solution at too early stage for the weed is injured even when in bloom.

KLOCKE, E.—Hederichvertilgung mit Eisenvitriol und die Syphoniaspritze.

Fühling's Landw. Ztg. 1898. S. 625.

Experimented with Oats using a 25 per cent solution and 60 litres per Morgen. The Charlock was in bloom and had overgrown the Oats. Charlock was killed and the Oat plants slightly touched, but recovered and grew with unexpected vigor.

KRAUS, C.—Nochmals zur Vertilgung von Hederich durch Bespritzen mit Eisenvitriollösung.

Deut. Landw. Presse, (1899), S. 659.
Jahresber. Agr. Chem. 42, S. 351.

Results doubtful.

KRÜGER, F.—Aufruf zum Kampf gegen das Unkraut, mit besonderer Berücksichtigung der Eisenvitriolbespritzen.

Wochenbl. d. Landw. Vereins in Bayern, (1904), S. 486.

A 15 per cent solution S. of I. applied at the rate of 400-500 l. per ha.

KUNTZE-DELITZSCH, L.—Vertilgung des Hederichs mittels Eisenvitriollösung

Ztschr. Ver. Deut. Zuckerindus. (1899), S. 699.

A 15 per cent solution S. of I. applied in form of a spray at the beginning of flowering is effective; applied later, ineffective.

LÜDECKE, ( ).—(Hederichvertilgung).

Ztschr. Landw. Kammer Schlesien, (1898), S. 721.

LÜDECKE, ( ).—Ein neue Methode zur Vertilgung des Hederichs.

Ztschr. Landw. Kammer, Schlesien, (1897), S. 745.
Jahresber. Agr. Chem., Bd. 40, S. 406.

A 10 per cent solution S. of I. kills Charlock and does not injure Oats and Clover.

MAIER, ( ). — Zur Frage der Vertilgung des Hederich (Dills) durch Chilisaltpeterlösung.

Wohnbl. Landw. Ver. Bayern, (1901), S. 501.

A 15 per cent solution S. of I. applied at the rate of 150 l. per ¼ ha, gave good results even when the weed was in bloom.

MAIER, ( ).—Vertilgung des Hederichs, (Dill).

Wchnbl. Landw. Ver. Bayern, (1902), S. 263.

MAIER, ( ).—Beiträge zur Hederichvertilgung.

Wchnbl. Landw. Ver. Bayern, (1903), S. 101.

MAIZIERES, ( ).—Produits chimiques et mauvaises Herbes. Nouvel emploi du sulfate de cuivre. Nos expériences. Nos formules.

Engrais, (1897), p. 540.

Formulæ for Sprays (per Hectare):

Sulphate of Iron.....	20 kgo.	30 kgo.
Sulphate of Copper.....	30 "	20 "
Sulphuric Acid.....	5 "	5 "
Water	945 "	945 "
	1000	1000

MARGUERITE-DELARCHARLONNY, P. — Destruction economique des Sénés, Sanves, Moutardes Sauvages, Moutardelles, Ravenelles.

Engrais (1897), p. 782.

A 15 per cent S. of I. solution applied at the rate of 800-1000 l. per Hectare.

MARGUERITE-DELARCHOLONNY, P.—(Destruction des mauvaises herbes par le sulfate de fer.)

Jour. Soc. Agr. Brabant et Hainaut (1897), No. 49. E. S. R. 9, p. 846.

MARIE, E.—Destruction des sanves par le sulfate de fer.

Jour. Agr. Prat., (1899), T. 1., p. 344.

A review of German work.

MARRE, E.—Essais de destruction de la sanve ou moutarde sauvage et de la Ravenelle.

Semaine Agr. (Paris), (1901), p. 358. E. S. R. 13, 658.

MARTIN, P.—Destruction des Sanves.

Jour. Agr. Prat., (1897), T. I., p. 861.

A 10 per cent solution S. of I. applied at the rate of 12-15 Hkt. per Hectare used to destroy Wild Mustard in Wheat fields. Corroborated the observations of Bonnet, Brandin and Bernard. Prefers S. of I. to Sulphate of Copper. Wheat, Clover and Black Medic suffered slightly from the treatment, but recovered in a few days.

OEHMICHEN, ( ).—(Hederichvertilgung).

Ztschr. Landw. Kammer, Schlesien, (1898), S. 177.

OEHMICHEN, ( ). — Unkrautvertilgungsversuche mittels verschiedener Metallsalslösungen.

Ztschr. d. Landw. Kammer, Schlesien, (1901), No. 25.

Recommends 2½ per cent S. of I. with 20 per cent Fertilizer Salt.

PERRET, M.—Un nouveau produit pour la destruction de la sanve.

Soc. Nat. d'Agr. de France, (1898), p. 382.

Mixture of S. of I. and Sulphate of Copper successfully used to combat Wild Mustard.

PLATZ, K.—(Vertilgung von Unkraut).

Fühling's Landw. Ztg., Bd. 51, (1904), S. 415.

REICH, E.—Über Hederichsvertilgungs-Versuche.

Thätigkeitber. d. Versuchst. f. Pflanzenkultur in Dresden, (1902).

Jahresber. Agr. Chem. Bd. 46, S. 247.

Centbl. Agr. Chem. Bd. 32, S. 679.

The weed is killed by the solution and by the powdered salt. For a Hectare use 666 l. of 15 per cent solution, 200-400 l. of 25 per cent solution.

REISCH, E.—Über Hederichvertilgungs Versuche.

Fühling's Land. Ztg. Bd. 41, (1903), S. 89.

Experimented with powdered S. of I. alone and mixtures of S. of I. with sugar, dextrine and ashes, and with following results:

Action of powdered S. of I.....Very good.
Action of S. of I., plus sugar .....Good.
Action of S. of I., plus dextrine .....Medium.
Action of S. of I., plus ashes .....Very good.

The action of a 15 per cent solution was good.

RIEHM, ( ).—Unkräutvertilgung durch Chemikalien.

Deut. Landw. Presse, (1901), No. 48, S. 430.

ROMMETIN, ( ). — Installation pour le sulfatage des céréales.

Jour. Agr. Prat., (1899), T. I., p. 651.

ROUSSILLE, ( ),—(The Destruction of Wild Mustard).

Bull. Soc. Nat. Agr. Fr. 64 (1904), No. 6, pp. 451-52.

S. of I. mixed with plaster, 300 and 200 Kgo. respectively per hectare, gave unsatisfactory results when applied to lettuce.

SCHADE, ( ). — Über Vertilgung des Hederichs durch Eisenvitriol.

Sächs. Landw. Ztschr., (1899), S. 25.

Jahresber. Agr. Chem., Bd. 42, S. 350.

A 15 per cent solution S. of I. did not touch the weed; 20 per cent solution did.

SCHRIBAUX, E.—Destruction des sanves.

Jour. Agr. Prat., (1899), T. II., p. 43.

SCHRIBAUX, E.—Un nouveau fléau a combattre invasion des luzernieres par une nouvelle espece de cuscute.

Jour. Agr. Prat., (1899), T. II., p. 272.

On account of the form of the plant the author recommends the abandonment of the Sulphate of Iron treatment and the use in its place of indirect means.

Studied the effect of Sulphate of Iron solutions on the germinative power of the cuscuta seed and found that soaking the seed for fifty days in a 20 per cent solution of the salt the germinative power was reduced from 19 per cent to 12 per cent.

SCHULTZ - SOEST.—Zur Vertilgung des Ackersenfs und des Hederichs.

Fühling's Landw. Ztg., (1897), S. 625.

Recommends a 15 per cent solution S. of I. applied at the rate of 600 l. per hectare.

SCHULTZ - SOEST, ( ).—Hederich-Vertilgung.

Ztschr. Landw. Kammer, Schlesien, 14 Mai, (1898).
Ztschr. Pflanzenkrank. Bd. VIII, S. 184.

Spraying with S. of I. Solutions killed weeds and did not injure Oats.

SCHULTZ - SOEST.— Zur Hederichvertilgung nach Prof. Weiss.

Deut. Landw. Presse, Bd. XXVI, S. 754.

SCHULTZ - SOEST.—Zur Vertilgung des Ackersenfs und des Hederich.

Fühling's Landw. Ztg. (1898), S. 393.

A 15 per cent solution of S. of I., applied at the rate of 400 l. per hectare, is as strong as necessary. Oats are in no way injured by the Spray.

SCHULTZ, ( ).—Zur Vertilgung des Ackersenfs und des Hederichs.

Landw. Ztg. Westfalen u. Lippe, (1897), S. 329.
Jarhesber. Agr. Chem. 40, S. 406.

A 30 per cent solution of S. of I. using 1 cbm. per hectare, completely eradicated Wild Mustard in fields of Barley. Oats showed signs of poisoning and stood still in growth for fourteen days but recovered completely.

Enough rain fell after spraying to wash off S. of I.

15 per cent solution S. of I. is strong enough for the work.

SCHULTZ, G.—Gegen den Hederich.

Wchnbl. Landw. Ver. Bayern, (1901), S. 399.

SCHULTZ, G.—Zur Hederich vertilgung nach Prof. Weiss.

Fühling's Landw. Ztg., (1899), S. 690.

SCHULTZ, G.—Zur Hederichvertilgung.

Landw. Ztg. Westfalen u. Lippe, (1901), S. 240.
Jahresber Agr. Chem. Bd. 44, S. 239.

A 15 per cent solution S. of I. applied at the rate of 125-150 l. per morgen successfully used. R. raphanistrum withstands. It does not destroy plants, it prevents their blooming.

SCHULTZ, G.—Zur Hederichvertilgung nach Prof. Weiss.

Landw. Ztg. Westfalen u. Lippe (1899), S 273.
Jahresber. Agr. Chem., Bd. 42 (1899), S. 351.

A weed-killing mixture called "Hederichtot" containing 6.85 per cent Ferrous oxide. Consists practically of S. of I., gypsum and sand.

SCHULZE, B.—Versuche über Vertilgung des Ackersenfs durch Besprengen mit Eisenvitriollösung.

Ber. Vers. Stat. Breslau (1898), 14.
Jahresber. Agr. Chem., Bd. 42, (1889), S. 350.

SHERINGHAM, H. C.—Charlock Spraying.

1st Ann. Rpt. of Field Expts., Irish Agr. Organization Soc. (1899), p. 43.

In field of Barley when the Charlock is very young the application of a 7½ per cent solution entirely successful. The barley was slightly bleached.

SHUTT, F. T.—Spraying for Destruction of Wild Mustard.

Appendix to Rpt. Min. Agr. Canada.
Experimental Farms Reports, (1899), p. 194. E. S. R. 12, p. 564.

A 5-10 per cent solution of S. of I. used at the rate of 50 gals. per acre in spraying plants 15-20 inches high, just beginning to flower, had no lasting results.

A 5 per cent. solution of S. of I. killed part of plants 6-9 inches high. The spraying should not be delayed until the plants are higher.

SOMERVILLE, Dr.—Eradication of Charlock in Corn Crops by Spraying.

Trans. Highland and Agr. Soc. Scot. 5th Ser. Vol. XIII, pp. 10-17.

SOMERVILLE, Dr.—Destruction of Noxious Weeds.

Queensland Agr. Jour. 4, (1899), No. 2, p. 149. E. S. R. 10, 1049.

Obtained best results with 7½ per cent solution, using 40 gals. per acre. Charlock killed, thistles blackened and injured, and cereals uninjured.

STEGLICH, ( ).—Zur Vertilgung von Hederich und Ackersenf mit Eisenvitriol.

Württemb. Wchnbl. Landw. (1898), S. 383.
Jahresber. Agr. Chem. Bd. 41, S. 319.

A 20 per cent solution kills Charlock and Wild Mustard when only a few drops strike the plants. The plants turn black, dry, and die inside of a week.

Young cereals show poisonous effect but recover in 8-14 days. Young Clover badly burned and apparently injured. Quotes Strebel who used a 15 per cent. solution.

STEGLICH, B.—Untersuchungen und Beobachtungen über die Wirkung verschiedener Salzlösungen auf Kulturpflanzen und Unkräuter.

Ztschr. Pflanzenkrank. Bd. 11 (1901), S. 31. E. S. R. 13, 253.

Used 20 per cent solution S. of I. Beets somewhat injured, potatoes seriously injured.

STEGLICH, ( ).—Eisenvitriollösung oder Vitriolpulver gegen Hederich?

Sachs. Landw. Ztschr. (1900), S. 217.

Jahresber. Agr. Chem. 43, S. 352.

Action of dry powders (weed killers) is doubtful. Young Clover injured and in part killed by S. of I. Old Clover withstands the treatment and outgrows slight injury in very short time.

STEGLICH, ( ).—Zur Unkrautvertilgung durch Aufspritzen von Salzlösungen.

Sächs. Landw. Ztschr. No. 13, (1902), S. 265.

Centbl. Agr. Chem. Bd. 32, S. 185.

STEGLICH, ( ).—Über Unkrautvertilgung durch Salzlösungen.

Sächs. Land. Ztschr. (1901), S. 401.

Jahresber. Agr. Chem. 44, S. 239.

Centbl. Agr. Chem., Bd. 32, S. 185.

STEGLICH, ( ).—(Why Sulphate of Iron Kills Mustard.)

Sachs. Landw. Ztschr. (1898), S. 217.

Explains the action of S. of I. on mustard by assuming that the sulphur in the Pottassium Myronate (C 10 H 18 NS 12 O 10 K) combines with iron to form Sulphide of Iron, thus causing death. Stender points out that Rape (B. napus oleifers) which also contains mustard oil is not injured, on the contrary is rendered more vigorous.

STEGLICH, ( ).—Das Weiss'sche Hederichvertilgungsmittel.

Deut. Landw. Presse (1899), S. 711.

Jahresber. Agr. Chem., Bd. 42, S. 352.

STENDER, ( ). — Hederich Vertilgung durch Künstliche Düngemittel.

Illus. Landw. Ztg. (1902), No. 33, S. 332.
Centbl. Agr. Chem., Bd. 32, S. 188.

The fear of reducing the yield by spraying has proven groundless.

Recommends mixture:

Sulphate of Iron	10 parts.
Sulphate of Ammonia	10 "
Water	100 "

STENDER, A.—Vertilgung gewisser Ackerunkräuter durch Metallsalze.

Mitt. Landw. Inst. Breslau, Bd. III, (1900), S. 73.
Jahresber. Agr. Chem. XLIII, S. 353.

Treated under six heads :

1. By what salts are Charlock and Mustard most injured?
2. What is best concentration for a spray?
3. What if best time for spraying?
4. Is it necessary to repeat spraying?
5. What useful plants are injured, and to what extent ?
6. What is the physiological reason for death?

Well developed Red Clover and Peas did not show injury. Beans were badly injured.

STRAUCH, ( ).—(Hederichvertilgung).

Ztschr. Landw. Kammer, Prov. Schlesien, (1898), S. 881.

TOEPFFER, J.—Die fahrbaren Spritzen und die Vertilgung des Hederichs durch Eisenvitriol.

Deut. Landw. Presse, Bd. 30, (1903), S. 291.

TRIBOULET, ROMMANTIN & ST. QUENTIN.—(Destruction of Wild Mustard.)

Bul. Soc. Nat. Agr. France, 64 (1904), No. 6, pp. 461-66.
Used S. of I. and Sulphate of Copper in powdered form.

VON UNWORTH.—( ).—Zur Vertilgung von Hederich durch Bespritzen mit Eisenvitriol (?)

Ztschr. Landw. Kammer, Schlesien (1899), S. 880.
Deut. Landw. Presse 26, 639.
Does not recommend S. of I. for killing weeds.

VANDERVAEREN, J.—Destruction des Sanves.

Jour. Agr. Prat. n. Ser. 5, (1903), No. 23, p. 731. E. S. R., 15, 266.
Application of 200 Kgo. dry powdered S. of I. per hectare. This method generally practiced in Belgium.

VESTERGAARD, A. B.—(On the Eradication of Charlock by means of Iron Sulphate solutions.)

Ugeskr. Landm. 47, (1901), No. 47, p. 451. E. S. R. 13, 756.

VIVIEN, A., ET L. GESCHWIND.—Essais sur la destruction des Sanves.

Engrais (1899), pp. 880-904.

Used mixtures of S. of I. and Sodium Nitrate with satisfactory results.

Sulphate of Iron	Nitrate of Soda	Rate per Hectare
10 Kgo.	1½ Kgo.	10 Hkt.
5 "	3 "	10 "
25 "		10 "
20 "		10 "

VOELCKER, J. A.—The Destruction of Charlock.

Jour. Roy. Agr. Soc. England. 3rd Ser. Vol. 10, (1899) p. 767.

WAGNER, Ph.—Destruction des Sanves.

Jour. Agr. Prat. T. I. (1898), p. 577.

Used 15 per cent solution of S. of I. at the rate of 600 l. per hectare. Did not observe injury to Clover, on contrary the plants took on a fresher appearance.

WEINZIERL, THEO. RITTER VON.—Über die Bekämpfung des Ackerhederichs.

Pub. K. K. Samen-Kontroll. Stat. Wien, No. 199, (1899), S. 13.

Used a 15 per cent solution of S. of I. in form of a spray. The S. of I. began to work inside of twenty-four hours. Cereals only slightly affected, especially Barley, but recovered quickly.

Peas and Clover are badly injured.

WEISS, J. E.—Die Bekämpfung des Hederichs durch Düngesalze.

Wchnbl. Landw. Ver. Bayern, (1901), S. 460.

Some comparisons made with S. of I.

WEISS, J. E.—Eine neue Hederichvertilgungs-Methode.

Deut. Landw. Presse (1899), S. 540.
Jahresber. Agr. Chem., Bd. 42, S. 351.

Secret compound called " Heufeld."

WEYDEMANN, M.—Nochmals zur Hederichvertilgung mit Eisenvitriol.

Deut. Landw. Presse, (1889), S. 703.
Jahresber. Agr. Chem. 42, S. 351.

WINTER, ( ).—(Hederichvertilgung)

Ztschr. Landw. Kammer Schlesien, (1898), S. 721.

).—(Eradication of Weeds by Spraying with Solution of Metallic Salts.)

Bul. Agr. (Brussels.) 1889, pp. 345 et suivantes.

Plots of oats were treated with the following solutions :

A. 4 kgo. Sulphate of copper to 90 l. of water.
B. 3 kgo. do. do. 91.5 l. of water.
C. 3 kgo. Sulphate of iron to 20 l. of water.

Using the first solution the results were completely satisfactory; using the other two solutions the results were not satisfactory.

In experiments made in Limbourg a 4 per cent solution of sulphate of copper and a 12 per cent solution of Sulphate of Iron were efficacious.

In the province of Namur experiments with oats led to the following results :

A. The most favorable time for the destruction of wild mustard with saline solutions corresponds with the appearance of the fifth or sixth leaves.
B. That sulphate of copper is more active than Sulphate of Iron. From the point of view of economy the S. of I. is to be recommended over the sulphate of copper.
C. The result of all the experiments is that a 20 per cent solution of Sulphate of Iron gave the best resnlts.

NOTE — The reference source is erroneous.

CAMPBELL (48) has carefully studied this method of eradicating the wild mustard and wild radish found in grain fields.

SPRAYING MACHINES

"In the experiments made by me in 1898, a knapsack sprayer was used, and it was then evident that a larger machine would be necessary. To meet the demand Messrs. Strawsons, 71A, Queen Victoria Street, London, E. C., adapted one of their

No. 1

potato sprayers to the work. In addition, they made a special and cheaper sprayer, which can be attached to an ordinary cart, and is capable of covering a breath of rather more than twenty feet.

Illustration No. 1 pictures this machine at work.

The pump is attached to an ordinary parraffin barrel, and is worked by an operator standing in the cart. In the larger machine the pump is geared with the traveling wheels.

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MATERIALS USED

The spraying materials employed consisted of Sulphate of Iron and Sulphate of Copper. The strength of the Sulphate of Iron solutions varied between 6 and 16 per cent, applied at the rate of from 35 to 40 gallons per acre, while in a few cases double that amount was applied by going twice over the ground. In the case of the Sulphate of Copper solution the strength varied from 2 to 3½ per cent, applied also at the rate of 35 to 40 gallons per acre.

The cost of the Sulphate of Iron was 6s per cwt., and that of the Sulphate of Copper 40s. The cost, therefore, of a 10 per cent solution of Sulphate of Iron works out at about 2s. 2d. per acre, and a 15 per cent solution at 3s. 3d. A 2 per cent solution of Sulphate of Copper costs nearly 3s. per acre, and a 3 per cent solution about 4s. 3d. per acre. These materials can, however, be had at a much cheaper rate, as the materials used in our trials were of an unnecessarily high standard of purity and were not purchased in the best market.

The two substances were analysed in our laboratory. The Sulphate of Iron was found to be practically pure, and the Sulphate of Copper had a purity of 95.6 per cent.

Inquiries show that Sulphate of Iron, sufficiently pure, can be had at 4s. per cwt. and even for 3s. if purchased in quantity. while Sulphate of Copper is quoted at a little over 30s. per cwt. Consequently the cost per acre of a 10 per cent and a 15 per cent solution of Sulphate of Iron need not be greater than 1s. 5d. and 2s. 2d. respectively. In the same way the cost per acre of the Sulphate of Copper solutions would be reduced to about 2s. 3d. and 3s. and 3d. respectively.

METHOD OF SPRAYING

The demonstrations were superintended in each case by Mr. Haydon or Mr. Burton.

The additional apparatus required includes a second barrel of the same capacity (42 gallons) as the one to which the pump is attached. A water-cart will also be required unless water is immediately accessible.

We will suppose a 10 per cent solution of Sulphate of Iron is to be used. The procedure is as follows:

Forty lbs. Sulphate of Iron is placed in a mixing barrel, and on this water is poured. The mixture is then well-stirred, and made up to 40 gallons, and after solution is transferred to the barrel in the car. While this solution is being distributed over an acre an assistant is engaged in preparing a charge sufficient for another acre, and so on.

In this way the work is only interrupted by the operation of transferring the solution from the mixing barrel to the sprayer. The operation was for the most part performed by

No. 2

the aid of two wooden buckets, a process which is slow and very disagreeable to the persons engaged in it. In consequence an arrangement was devised for overcoming this difficulty by temporarily fixing a semi-rotary pump to the mixing-barrel and transferring the liquid by means of this pump and a hose into the sprayer. The arrangement is shown in the accompanying illustration No. 2. The pump is so constructed that it may either be used for filling the mixing barrel out of a ditch or stream, or for transferring the solution from the mixing-

barrel to the sprayer. In this way the use of buckets is entirely dispensed with. The cost of this supplementary apparatus is £5 11s., and such a pump can deliver 1,100 gallons per hour. Where a large area is to be sprayed its use is recommended.

In discussing the results it will be convenient to take them under the following heads:

I. EFFICIENCY OF MACHINES

Where the solutions were free from particles of solid matter the spray produced by both machines gave complete satisfaction, but great care had to be taken to prevent foreign material gaining entrance to the reservoir. Even very small particles will choke the nozzles. The outer nozzles are much more liable to be obstructed than those in the center. Fortunately any obstruction in the nozzles can be quickly removed.

It is necessary to have a supply of water free from solid particles, and the reservoir of the sprayer and the inside of the mixing-barrel have to be very carefully washed out before the operations are started.

With each sprayer a sieve is provided through which the solution may be strained, but in addition it is advisable to pass it through a piece of very fine sacking.

One of the disadvantages of the smaller machines was the difficulty in getting a sufficient quantity of the solution applied. An attempt was made to put on about 40 gallons per acre, but 35 was found more practicable.

Messrs. Strawsons inform me that it is their intention next year to provide their smaller machines with a larger pump without additional cost. The problem of delivering a sufficient quantity at one dressing will thus be solved. With this improvement the smaller machine will meet the requirements of any one wishing to spray charlock or runch. The larger machine is, of course, more easily worked, but unless the farmer intends to make use of it for spraying potatoes as well as charlock, the smaller machine will sufficiently meet the case.

The area that can be sprayed with one of these machines in one day will of course depend upon the facilities for obtaining water. On account of the experimental nature of the work, there were many delays that would not occur in ordinary practice. Taking into account the delay involved in recharging the machine a day's work can only be reckoned at from 15 to 20 acres.

II. INFLUENCE OF WEATHER

At a very early stage in the tests it was quite apparent that the influence of the weather was a most important factor in determining the success or failure of the operation.

The first trial was at Emley, and was made on a bright, dry and calm day. At this centre the operation was a decided success. The second test was at Stainton on a showery day. Of all the centres this was one of the least successful. At Wressle, where the third trial was made, the weather was not only wet but very windy, and it was found that the spray was blown by the wind against the rows of corn, which acted as a shelter to the charlock growing between them, and this, combined with the wet weather, brought about a result scarcely more successful than that at Stainton.

As it was very evident that the operation, if performed during wet, windy weather, would be only attended by very slight success, no further demonstrations were made until the weather had improved. Thereafter the experience was uniform, viz.: that charlock or runch sprayed with a proper amount of material, before, during, or immediately after wet weather, to a large extent, escaped destruction, the same being the case when the weather was windy; when, however, the spraying was done in dry weather and on a bright calm day, with a sufficient quantity of solution of the requisite strength, the results were equally uniform, viz.: the leaves of charlock were blackened and eventually completely destroyed.

III. THE INFLUENCE OF AGE OF THE CHARLOCK

Unfortunately the weather broke at a time when a large number of demonstrations had been arranged. One was made at the proper time, viz., at Emley. In this case the charlock plants were just getting into rough leaf, and the rows of barley were about three inches high. The result was that where the solutions were put on in proper quantity the effect on the charlock was to reduce the leaves to a black cinder, from which few recovered. As the season advanced the plants at other centres became larger and larger, and in some cases attempts were made to kill plants that had formed a strong stem and were in full flower.

The results of spraying fully grown charlock varied according to the strength of the solution, but in all cases when the weather was suitable the leaves were killed, but the flowers and stems were only partially destroyed.

It was abundantly proved that success can only be obtained when the plants are taken in the youngest stage. The operation is calculated to destroy charlock leaves only.

If the charlock is sprayed after the stems and flowers are formed, though the leaves are destroyed, the stems and flowers retain sufficient vitality to form seeds, the number of which is, however, much less than in the case of a plant in its normal condition. Spraying strong, well-grown charlock produces a stunted growth, and enables the corn, if good, to gain the mastery of it. It was noticed that although the leaves were killed and the stems damaged the formation of seed was hastened.

IV. STRENGTH OF SOLUTION

On account of the probable danger of destroying the corn and the young seeds, rather weak solutions were at first applied. Later, however, these were strengthened in the case of Sulphate of Iron to 12, 14 and 16 per cent, and other conditions being suitable 40 gallons per acre of such solutions will give satisfactory results.

But for the difficulty of making stronger solutions and also the difficulty of getting the machine to apply the desired quantity, still heavier doses of Sulphate of Iron would have been applied.

It was quite apparent on the one hand that solutions of greater strength would not injure the corn, and on the other hand that weaker solutions would not effect the desired destruction of charlock and runch.

The general experience with regard to the strength and quantity of solution was that the largest doses produced the best results, and that 2 per cent solutions of Sulpate of Copper or anything under a 10 per cent solution of Sulphate of Iron was much too weak to be really beneficial. It must be borne in mind, however, that these strong solutions were applied to strong grown charlock. Owing to the weather we were not permitted to test them on very young plants.

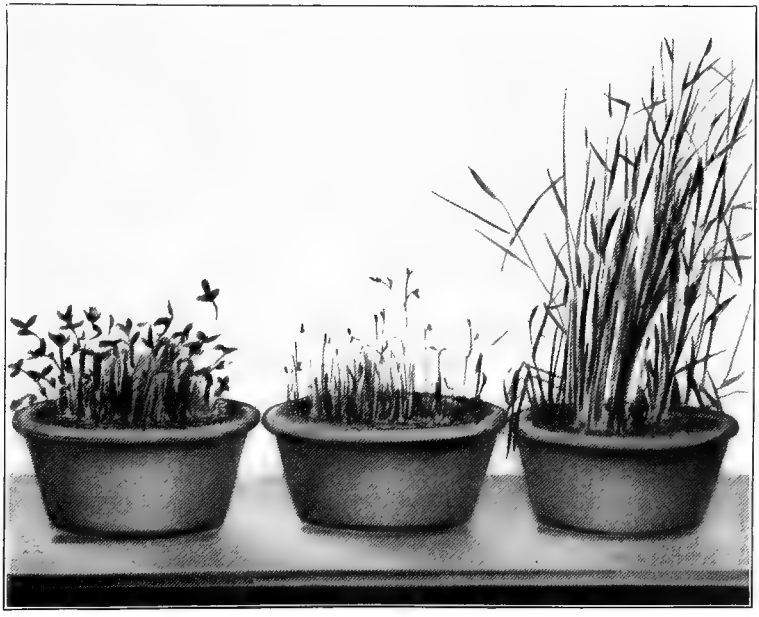
Those who intend to spray next year should try 40 gallons per acre of a 10 and a 15 per cent solution of Sulphate of Iron at the proper stage.

V. EFFECT ON THE CORN

The crops sprayed comprised both oats, barley, and the spring wheat. In a few cases it was reported that after spraying the corn became greener, but certainly this applied to the portions dressed with Sulphate of Iron rather than to those dressed with Sulphate of Copper. There was no complaint from any centre of deterioration either in quality or quantity of the grain crops sprayed. Neither was there any difference observed in times of ripening.

VI. EFFECT ON CLOVERS AND GRASSES

The experiments conducted by me last year in Scotland on the spraying of charlock growing among young seeds led me to the conclusion that the application of Sulphate of Iron



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(For description see following page)

would not have any evil effect upon these plants, even in the tender condition in which they are to be found in the spring-time. This opinion was throughout the experiments completely confirmed, as in no case has there been any complaint of damage done to young clover or grasses.

The accompanying illustration shows three pots containing red clover, mustard, and wheat respectively. All three sprayed while quite young with equal quantities of a 12 per cent solution of Sulphate of Iron, the quantity applied being greatly in excess of that which is used in ordinary practice. As will be seen from the illustration neither the clover nor the wheat was injured, whilst the mustard was entirely destroyed.

VII. COMPARATIVE EFFECT OF SULPHATE OF IRON AND SULPHATE OF COPPER

In our trials Sulphate of Iron was for the most part employed. It is less inimical to plant life than Sulphate of Copper, indeed it has been often applied as a fertilizer. The advantages attending the use of Sulphate of Copper lies in the fact that a much less weight of it is required, and it is much more pleasant to use. The difference in the cost per acre is not a serious consideration. Sometimes the one cost more per acre than the other, depending upon the market. When large crystals of either salt are used it takes a considerable time to get a solution, particularly when a strong one is desired. The difficulty may be overcome by having it well ground, but in the form of a powder Sulphate of Iron rapidly oxidizes, and on being dissolved produces a flocculent precipitate of the hydrate of iron, which, however, does not cause a stoppage of the nozzles. The particles of this precipitate very quickly became white on the plant, but did not do any damage either to the charlock or corn.

VIII. COMPARATIVE EFFECT ON CHARLOCK AND RUNCH

As is well known to farmers in Yorkshire, there are two weeds infesting corn fields, charlock and runch, which somewhat resemble each other. The charlock has a yellow flower, while the petals of the runch are whitish, with violet vein, and

the foliage leaves are thicker than those of the charlock. Both kinds were abundant, and it was found that charlock was more easily destroyed than runch.

IX. EFFECT OF THE SPRAY ON OTHER PLANTS

In order to test a solution of Sulphate of Iron on a variety of other plants, Mr. Haydon sowed in pots at the experimental farm at Garforth, seeds of the plants named in the following table, and sprayed the seedlings with a 12 per cent solution of Sulphate of Iron.

The only plants seriously affected were beans, mustard, turnips and swedes. Of the last three, which all belong to the same order as charlock and runch, the mustard suffered much more than turnips, while the swedes suffered least.

The destruction of the beans at Garforth was evidently due to the large quantity of the solution applied. At one of the centres a small plot of beans was treated at the rate of 35 gallons per acre without serious damage to the plants.

X. THE EFFECT OF DOUBLE SPRAYING

In a few cases the crops were sprayed twice on the same day, a plan that was found to answer well, and it appeared that double application is an advantage even if the solutions used be somewhat weaker.

When inspecting the experiments it was noticed at many of the centres that a second batch of plants had grown since the spray had been applied. If a second application had been used after an interval of about ten days this second crop also would have been destroyed.

On account, however, of the great demand for trials with the sprayer, we did not succeed in returning a second time to any of the centres to put this plan to the test.

XI. THEORY OF THE ACTION OF THE SPRAY ON CHARLOCK

Nothing certain is known with regard to the specific action of solutions of Sulphate of Iron and Sulphate of Copper on charlock plants. The point requires careful consideration, and is at present being investigated by Mr. Ingle, agricultural chemist to this department.

It cannot be due to the roughness of the charlock leaves retaining the spray, for there are many other plants which retain the spray equally well and yet escape injury. In all probability the result is due to the fact that cruciferous plants contain certain substances peculiar to their order—substances which may react chemically with iron or copper salts.

In summing up the experience gained in spraying 144 acres of charlock and runch infested grain crops in Yorkshire, we may conclude :

1. That the operation is only completely successful when the plants are taken in the youngest stage.
2. That a bright, dry and calm day is a necessary factor to success.
3. That in the case of Sulphate of Iron at least a 10 per cent solution is required, and this should be applied at the rate of not less than 40 gallons per acre. Even a 15 per cent solution of Sulphate of Iron may be necessary if the plants have got beyond the first rough leaf stage.
4. Such solutions will not injure either corn or young seeds.

PLANTS GROWN IN POTS AT GARFORTH, AND SPRAYED WITH A 12 PER CENT SOLUTION OF SULPHATE OF IRON

KIND OF PLANT	RESULT
Peas	Slightly damaged.
Scarlet Runners	Slightly damaged.
Broad Beans	Leaves scorched.
Carrots	Very little damage done.
Parsnips	Very little damage done.
Onions	Very little damage done.
Leeks	Very little damage done.
Lettuce	Injured.
Radish	Injured.
Cress	Injured.
Mustard	Completely killed.
Beet-Root	Slightly damaged.
Swedes	Leaves blistered.
White Turnips	Leaves blistered.
Mangels	Leaves blistered.
Red Clover	Leaves blistered.
Cow Grass	Practically uninjured.
White Clover	Practically uninjured.
Trefoil	Practically uninjured.
Alsike	Practically uninjured.
Perennial Rye Grass	Practically uninjured.
Italian Rye Grass	Practically uninjured.
Timothy	Practically uninjured.
Wheat	Practically uninjured.
Barley	Practically uninjured.
Oats	Practically uninjured.
"Seeds" with some White Mustard.	Mustard killed, but "seeds" uninjured.

The solution was also tried at Garforth on a large number of different weeds, none of which were of the charlock tribe. In no case were these weeds exterminated. An excessive dose did damage to daisies and plaintain in pasture without equal harm to the grass plants.

Date of Test	NAME OF CENTRE	Kind of Crop	With or Without Seeds	Strength of Sulphate of Iron Solution	Strength of Sulphate of Copper Solution	Weather	Condition of Charlock	Condition of Crop	Area Sprayed Acres	RESULTS
May 5	Old Hall, Emley	Barley	——	6, 8, 14 per cent	2 per cent	Calm and bright	Just in rough leaf	3 inches high	5	Charlock all killed with strong solution and much checked with weaker. No damage to corn.
May 18	Stainton Manor, Rotherham	Barley	Seeds	8½, 10, 11½, 13, 14¼ per cent	——	Windy	Just in rough leaf	3 inches high	5	Runch not killed but checked.
May 18	Wressle, Howden	Oats	——	11½, 13, 14¼, 15¾ per cent	——	Windy and wet	Very thick, strong	3 inches high	5	Wind and rain immediately followed spraying. Charlock browned but not killed.
May 27	Wressle, Howden	Oats	——	10 per cent	——	Fine	Very thick, strong	4 inches high	5	Spraying repeated. Charlock demolished.
May 26	Huntow Farm, Bridlington	Spring wheat	——	7¾, 10, 11 per cent	——	Windy, with showers	Strong	4 inches high	4	Some of the charlock killed, remainder much checked.
May 27	The Grange, Bridlington	Barley	Seeds	7¾ per cent	——	Fine	Strong	4 inches high	1	Charlock partially killed. Seeds not injured.
May 29	Pollington, Snaith	Oats	——	7½, 8¾ per cent	——	Fine	Thick, almost in flower	Rather big	5	Charlock slightly checked, but not killed. Solutions not strong enough.
May 30	Hutton Cranswick	Oats	Seeds	7½, 10 per cent	——	Fine, but windy	Fairly abundant, small	3 inches high	2	Not all killed, but good results obtained, especially with strong solution.
May 30	Hutton Cranswick	Oats	——	10, 12½ per cent	——	Fine, but windy	Stronger	3 inches high	2	The strong solution produced a satisfactory result. No damage to seeds or corn.
May 30	Pollington Grange, Snaith	Barley	Seeds	10, 12½, 14 per cent	——	Very fine	Very thick, just flowering	Rather big	11	Considerably checked. Eventually overcome by corn.
May 31	Laxton, Howden	Oats	——	10, 11¼, 12½ per cent	——	Very fine	Strong, just flowering	Knee deep	7	Charlock damaged.
June 1	Waplington, Pocklington	Oats	Seeds	7½, 8¾, 10 per cent	1¾ per cent	Fine	Not thick, but strong	4 inches deep	8	Foliage of runch destroyed, but many stems retained vitality.
June 3	Waplington, Pocklington	Barley	——	10, 12½ per cent	——	Very fine	Much smaller	4 inches deep	5	Charlock not killed outright, but injured.
June 1	Staincliffe Lodge, Aughton	Oats	——	10, 11¼, 12½ per cent	——	Rather windy	Very thick, just floweriug	Tall	5	Only partially killed even with strong solution.
June 2	Shipton-Thorpe, Market Weighton	Barley	——	10, 11¼ per cent	1¾ per cent	Rather strong wind	Very thick, just flowering	Tall	4	Good results with strong solution where sprayed twice over. Sulphate of Copper not so good.
June 6	Givendale, Boroughbridge	Barley	——	10, 11¼, 11¾, 12½, 13¾ per cent	——	Very fine	Very thick, mostly in flower	Knee deep	13	Charlock nearly all killed when double sprayed. Leaves stripped off with single dressing.
June 6	Stonehills, Bridlington	Spring wheat	——	12½, 14, 15 per cent	3½ per cent	A little wind	**Very strong** and plentiful	Knee deep	12	Not successful.
June 7	Birkby Nab, Ripon	Oats	——	10 per cent	——	Windy	Very thin	3 inches high	3	Very little charlock to be killed.
June 8	Sherburn, E. R.	Oats	——	10, 16⅔ per cent	——	Windy	In full flower	Rather tall	2	Charlock checked.
June 9	Thrope Hall, Howden	Barley	Seeds	12½ per cent	1¾ per cent	A little wind	In full flower	Rather tall	12	To strong and old to be killed completely.
June 10	Scurff Hall, Drax	Oats	——	——	2½, 3 per cent	Fine	Very big and strongly grown	2 feet high	6	Charlock nearly all killed.
June 12	Sutton-on-Derwent	Oats	——	10, 12½, 15 per cent	3½ per cent	Very fine	In full flower	Rather big	5	Successful.
June 13	Leconfield Park, Beverley	Oats	——	——	2, 2½, 3, 3⅓ per cent	A little wind	Seed pods forming	Tall	7	Large number killed. Charlock 2½ feet high.
June 14	Hunmanby	Barley	Seeds	10, 12½, 15 per cent	——	Rather windy	Charlock small	Short	5	Charlock killed with strongest solution.
June 15	Carr House, Tickhill	Barley	——	14 per cent	2 per cent	Fine	Charlock just in flower	6 inches deep	5	Charlock nearly all dead where sprayed twice over.

AUTHOR'S INDEX

The abbreviations used in designating the periodicals from which the following titles have been taken are those prepared under the direction of Dr. E. W. Allen and used by him in the Experiment Station Record.

In the following pages parentheses are used to indicate defective titles, translated titles, unknown authors, and missing given names or initials.

The abbreviations "S. of I." and "S. of C." stand for sulphate of iron and sulphate of copper respectively.

6 ANDERSON, J. R.—Wild Mustard.

Dept. Agr. Brit. Columbia Bul. 11, p. 12.
E. S. R. 15, p. 265.

Destruction of Brassica sinapistrum by spraying with S. of I. and S. of C.

7 COMMISSION DE LA SOC. D'AGRIC. DE L'AUDE.—Le sulfate de fer et la chlorose.

Jour. Agr. Prat. (1892), T. 2, p. 811.

8 AUDOYNAUD, ( ).—Adaptation au sol des cépages américains.

Jour. Agr. (Paris), T. 16 (1881), p. 302.

Disputes M. Millardet's iron theory.

9 AULD, J. McQUEEN.—Oxide of Iron for Foot-Rot.

Fla. Disp., Farmer and Fruit Grower, n. ser., Vol. 3 (1891), p. 463.

Recommends the use of 5 to 15 lbs. per tree.

10 BARLOW, J. J.—(Effect of Sulphate of Iron on Potatoes).

Farm & Home, Dec. 8, 1888.

11 BARBUT, G.—Sur le traitement de la chlorose par le procédé Rassiguier.

Prog. Agr. et Vit., T. 22 (1894), p. 462.

Favors treatment in autumn—middle of October to middle of November. Used 40 per cent solution of S. of I. for old vines, and on young vines a 20-25 per cent solution. Results satisfactory.

S. of I. in same quantity applied to the roots did not produce the same effect.

12 BARTH, M.—Die Gelbsucht der Reben.

Weinbau u. Weinhandel (1895), S. 453 and 461.

Centbl. Agr. Chem., Bd. 25, S. 445.

Action of S. of I. not pronounced.

13 BEACH, S. A.—Some Bean Diseases. (Anthracnose of the Bean.)

N. Y. St. Bul. No. 48, n. ser., Dec. (1892), p. 308.

E. S. R. 4, p. 558.

To combat anthracnose of the bean, soaked seed in S. of I. solution, 1 oz. to 1 gal. of water, with following result:

Stand secured..... 88
Marketable Yield..... 71
Yield of Poor Beans.....132

This shows serious injury was done by the soaking.

14 BEACH, S. A.—Treatment of Potato Scab. (Oöspora scabies.)

N. Y. St. Bul. No. 49, n. ser. Jan. (1893), p. 1.
E. S. R. 4, p. 560.

On non-infected soil seed soaked in a S. of I. solution (1 oz. to 1 gal.) gave the best result.

15 BEDFORD. (HERBRAND ARTHUR RUSSELL), DUKE OF & S. U, PICKERING.—Liquid Dressings Applied to Strawberries during the Fruiting Season.

Report of the Workings & Results of the Woburn Experimental Fruit Farm, Second Rpt. (1900), p. 89.

16 BEHRENS, ( ).—Experiments on Killing Weeds.

Wochenblatt des Landw. Ver. im Grossherzogtum Baden (1902), No. 33.

Centbl. Agr. Chem., Bd. 33, S. 69.
S. of I. successfully used on calcareous soils.

17 BEINLING, E.—Über das Auftretin von Reben krankheiten im Grossherzogtum Baden im Jahre, 1891.

Ztschr. Pflanzenkrank. (1892), S. 307.

Sphaceoloma ampelinum: Used a 5 per cent solution S. of I. in the springtime (Feb.-Mar.) with good results.

Dematophora necatrix: 4000-5000 vines fertilized with S. of I. in autumn, using 120-200 grams per vine. In the following year the treated vines showed better growth and developed numerous new thread roots.

For true Chlorosis, fertilize with 100-300 grams per vine.

18 BELL, ( ).—Manures: their Sources.

Composition & Application, p. 100.

19 BELL, E. W.—Sulphate of Iron as a Manure for Potatoes.

Chem. News, Vol. 71 (1895), p. 15.

20 BENARD, J.—(Eradication of Weeds.)

Bul. du Comice agricole de Reims, Vol. 34 (1898).

For the eradication of weeds used 5, 10 and 15 per cent solutions of S. of I. and found them inefficient; 20 per cent solution efficient but less so than 2 per cent S. of C. solution.

21 BENECKE, W.—Die zur Ernährung der Schimmel pilze nothwendigen Metalle.

Jahrb. Wiss. Bot., Bd. 28 (1895), S. 526.

22 BERNARD, A.—Essai de theorie de l'action du sulfate de fer contre la chlorosis.

23 BERNARD, A.—Le Calcaire sa Determination et son Role dans les Terres arables, 1902.

Chap. IV.

24 BERTELS, C.—( ).

Allg. Landw. Monatschr., Bd. VII, Jahrg. (1842).

Found S. of I. present in a soil which he examined and recommended the application of lime to the soil to overcome any bad effect.

25 BERTRAND, G.—Sur l'intervention du Manganèse dans les oxydations provoquées par la laccase.

Compt. Rend. Acad. Sci. (Paris), T. 124 (1897), p. 1032.

26 BESELER, W.—Versuche mit Vitriolspritzungen zu verschiedenen Früchten auf Cunrauer Moordammen.

Mitt. Ver. Ford. Mookult. (1902), S. 281.

Deut. Landw. Presse, Bd. XXIX (1902), S. 680.

Jahresber. Agr. Chem., Bd. 45, S. 67.

Experimented with Horsebean. Sprayed with solution of S. of I., 60 pfd. to 100 litres, applied to ¼ ha. Sprayed piece showed no improvement over unsprayed.

27 BIEDENKOPF, H.—Zur Frage zur Bekämpfung des Hederichs, speziell durch Metallsalzlösungen.

Deut. Landw. Presse, No. 46 (1901), S. 406.

Has made no study of what he writes, but thinks that no quantitative work has been offered on yield from sprayed vs. unsprayed plots. Thinks soil injured and plants poisoned.

28 BIRNER & LUCANUS.—Wasserculturversuche mit Hafer.

Landw. Vers. Stat., Bd. VIII (1886), S. 145.

Manganese can in no way replace iron. Ferrous salt (phosphate) can replace ferric phosphate to advantage.

29 BLACKMAN, ( ).—(Iron filings benefitted pear trees.)

Fla. St. Hort. Soc. (1903), p. 103.

30 VON BLUCHER, ( ).—(Hederichvertilgung.)

Ann. Landw. der Mecklenburg Vereins (1903), No. 22.

31 BOIRET, ( ).—(Die zerstörung der Kleeseide durch Eisensulfat.)

Jour. Agr. (Paris) (1899), T. 11, p. 779.

32 BOIRET, H. & G. PATURAL.—Recherches sur l'emploi agricole du sulphate de fer.

Ann. Agron., T. 18 (1892), p. 417.

33 BOLLE, ( ).—(Anthracnose of Grape.)

Atti memorie dell'Instituto di Gorizia, 1892.

Recommends a mixture for Anthracnose of grape.

Sulphate of Iron ..... 50 Kgo
Sulphuric Acid .....5 "
Water .....100 "

Dissolve the S. of I. in hot water, then add the acid and stir well. Use before cold, applying to the vines with brush or swab. Apply 15-20 days before buds start to open.

34 BOKORNY, TH.—Eine bemerkenswerthe Wirkung Oxydierter Eisenvitriollösungen auf lebende Pflanzenzellen.

Ber. Deutsch. Bot. Gess. VII, Heft 7.

35 BORKONY, TH.—Vergleichende Studien über die Giftwirkung verschiedener chemischer Substanzen auf Algen and Infusorien.

Archiv. Physiol. (Pflüger), Bd. 64 (1896), S. 262-306.

S. of I. shown to be only weakly poisonous.

36 BORDRY, E.—Le procédé Rassiguier contre chlorose de la vigne.

Jour. Agr. Prat. (1896), T. II, p. 293.

Writes on M. Louet's results with the method and compares with his own.

37 BORNIER, ( ).—(Chlorosis.)

Rev. Vit.

Used a 50 per cent solution with the result that not a trace of Chlorosis manifested itself during the season.

38 BOUSSINGAULT, ( ).—Agronomie, Chemie, Agriculture et Physiologie, (1874).

Showed chlorotic and non-chlorotic leaves to contain almost same amount of iron.

39 BRACCI, ( ).—Sull' azione del solfato di ferro sulle piante.

Staz. Sper. Agr. Ital., Vol. XV, pp. 38-45.

Wheat and oats ripened earlier and yielded more grain and straw. The straw of the oats showed increased content of Fe_2O_3 and P_2O_5.

40 BRANDIN, ( ).—La Destruction des Sanves.

Bul. Soc. Nat. Agr. France (1900), p. 451.

Experimented with 95 Hect. oats and 45 Hect. wheat. Mustard apparently badly injured by 12 per cent solution but recovered to vigorous growth. 3½ per cent S. of C. destroyed completely.

41 BRETFELD, ( ).—Das Versuchswesen auf dem Gebiete der Pflanzenphysiologie.

(1884), S. 135.

42 BRETON, ( ).—(In Bernard's La Calcaire sa Determination et son Role dans les Terres arables, (1902), p. 158.)

Bernard quotes a gardener named Breton who lived in Haute-Marne (Meures) whose secret for growing the most delicious melons ripening early, was the use of Sulphate of Iron.

43 BROOKS, W. P.—Report of Agriculturist.

Mass. Hatch Sta. Rpt., (1896), pp. 9-49.

S. of I. applied to plots of Soy Beans at the rate of 80 lbs. per acre. Difference in favor of the treated plots over the untreated plots was at the rate of 525 lbs. per acre, the crop being cut green for silo. Applied June 24, just as beans were coming up.

44 BRÛLÉ, ( ).—(Eradication of Weeds by Spraying with Solutions of Metallic Salts).

Comice agricole de l' arrondissement de Reims, 1898.

Claims that 5, 10, 15 per cent solutions are inefficient; that a 20 per cent solution is less efficient than a 2 per cent solution of sulphate of copper. It is necessary to employ solutions containing more than 25 per cent of S. of I. and these solutions rapidly corrode the apparatus.

45 BRUNET, R.—L'anthracnose et le rougeot.

Jour. Agr. Prat. (1895), No. 36, pp. 338-340.

S. of I. successfully used again Gleosporium ampelophagum. Solution made of,

S. of I.....50 Kgo.
Sulphuric Acid ..... 1 Litre.
Water .....100 Litres.

Wash the vines carefully and if result is not obtained, wash a second time two weeks later. When the disease has a good hold, treatment not a success.

46 BUBAK, F.—Über eisenfleckige Kartoffeln.

Ztschr. Landw. Versuchswesen Oesterr. (1902), S. 396.

Centbl. Agr. Chem., Bd. 32, S. 182.

Probably caused by excess of iron in a soil poor in lime.

47 BUNGE, G.—Über die Assimilation des Eisens.

Ztschr. Physiol. Chem., Bd. 9, S. 49-59.

48 CAMPBELL, J. R.—Report on the Spraying of Charlock and Runch.

Yorkshire Col. Leeds and East and West Ridings Joint Agri. Council, Garforth Expts. (1899).

49 CAPUS, J.—(The Destruction of Grapes affected with Black Rot.)

Rev. Vit., T. XXII (1904), p. 413-414.

Author recommends treating dried pomace with a strong solution of S. of I. to prevent the rot being carried by pomace.

50 CASTREX, ( ).—(Grape Anthracnose in Tunis.)

Bul. Dir. Agr. et Com. 4, (1899), pp. 11-70. E. S. R. 11, p. 59. Recommends treatment in winter with S. of I. and lime.

51 CAZEAUX-CAZALET, G.—Note sur les causes de la chlorose des vignes et sur les moyens de prevenir et de traiter cette affection.

Brochure (1892).

Treated in August using 10 litres of 10 per cent solution. Cause of maladie in roots.

52 CAZENEUVE, P. ET A. NICOLLE.—Sur la réaction du sulphate de fer vis-a-vis des phosphates calciques employés en agriculture.

Monit. Sci., T. 39, p. 334.

Jahresber. Agr. Chem., N. F., Bd. 35, S. 258.

53 DE CÉRIS, A.—Le sulfate de fer pour la destruction des sanves.

Jour. Agr. Prat. (1900), T. 11, pp. 40, 220. Letter from M. Marguerite-Delarcholonny claiming discovery of the necessity for two sprayings.
Tour. Agr. Prat. (1900), T. II, pp. 40, 220.

54 CHATIN, AD. & A. MUNTZ.—Étude chimique sur la nature et les causes du verdissement des Huitres.

Compt. Rend. Acad. Sci. (Paris), T. 118, p. 17.

55 CHAUZIT, B.—Le sulfate de fer en viticulture.

Rev. Vit., T. I, p. 314.

56 COBB, N. A.—Notes on Diseases of Plants.

Agr. Gaz. N. S. Wales, Vol. II, p. 57.

For peach rust, recommends burning the leaves and spraying the trees in winter with S. of I. (1 lb. to 8 gals. of water.)

57 COCHRAN, ( ).—Ceylon Manual of Chemical Analysis, p. 202.

58 COHN, ( ).—Beiträge zur Biologie der Pflanzen. (1870). s. 119.

Iron in cell walls of algae as incrustation.

59. COSTE, H.—Instruction pratique sur les traitements à effecteur contre le mildew et l'anthracnose.

Ann. Soc. d'hort, et d'hist. nat. de l'Herault. 2 ser., T. XXIII, (1891) pp. 178-182.

Apply a warm 50 per cent solution of S. of I. with brush or spray before growth starts in the springtime. On making up the solution moisten the crystals with sulphuric acid before dissolving.

60 COSTE-FLORET.—Role du sulphate de fer.

Prog. Agr. et Vit., 26, (1896), Nos. 42, pp. 434-440; 43, pp. 463-467; 44, pp. 496-504.

Favorable results claimed for calcareous soils. Efficacious as producing secondary reactions. In large quantity is a corrosive. A palliative with chlorosis not a remedy.

61 CRAIG, J.—Grape Anthracnose.

Report of Horticulturist.

Appendix to Rpt. Min. Agr. Canada.

Experimental Farms Reports 1892, pp. 99-101.

62 CRAIG, J.—Small Fruits, Grapes (Sphaceloma Ampelinum).

Rpt. of Horticulturist.

Appendix to Rpt. Min. Agr. Canada.

Experimental Farms Reports, 1891, p. 125.

A solution of S. of I., 1 lb. to 10 lbs. water was used as a wash. The treatment was ineffectual in preventing the spread of the disease.

63 CROCKER, E. F.—(Destruction of Ustilago cucumis.)

In Griffith's, A Treatise on Manure, p. 302.

64 CROLAS, DR.—Le Phylloxéra dans le départment de l'Ain. Le Phylloxéra An. II (1878) p. 43.

Used the following mixture to sustain the vine during the treatment for the destruction of phylloxera and with good results:

Potassium Chloride .....60 parts
Sulphate of Iron..... 4 "
Sulphur (powdered) .....36 "

Used 25 grams per vine. Mentions (P. 46) an excellent fertilizer for vines known as "Davis Fertilizer Insecticide" composed of calcium carbonate, Sulphate of Iron, and caustic potash.

65 CROZIER, A. A.—On the Effects of Certain Fungicides upon the Vitality of Seeds.

Jour. Mycol., Vol. VI, (1890), pp. 8-11.

Seed corn soaked 24 hrs. in solution of 1 lb. S. of I. to a bushel of seed, with sufficient water to cover the grain.

Result: Nearly as injurious effect as Sulphate of Copper. No scorching of leaves observable even with the strongest solution.

66 CUGINI, G.—Sull' utilità del trattamento dei frutti pomacei col solfata di ferro.

B. Ort. Firenze, An. XII, (1887), pp. 51-56.

Explains M. Ville's observations. The S. of I. is forced through the stomata, or by osmotic action through the cell wall of the outer skin of the fruit, and occasions increased work of the plasma, and in the presence of light the formation of numerous chloroplastids, and these lead to greater activity in the process of assimilation, whereby growth results.

67 CUGINI, G.—Intorno al modo di esistere del ferro nelle piante.

Staz. Sper. Agr. Ital. Vol. XXVII, p. 649.
Disputes the views of Molisch.

68 CULERON, P.—Nouveau mode d'emploi du sulfate de fer contre la chlorose.

Jour. Agr. (Paris), T. II. p. 340.

Used one Kgo. S. of I. to 40-50 l. water per vine. Recommends a compost made of S. of I. one part, grape marc three parts.

69 DAVY, SIR HUMPHREY.—Elements of Agricultural Chemistry.

London, 1814, p. 334.

70 DEGRULLY, L.—Traitement de la chlorose par le badigeonnage d'automne au sulfate de fer.

Prog. Agr. et Vit. T. 22, (1894) p. 334.

71 DEGRULLY, L.—Traitement de la chlorose par l'application de sulfate de fer sur les plaies pratiquées en été.

Prog. Agr. et Vit. T. XXVI, p. 113.

Messine process is dangerous. Rassiguier process less dangerous and gives splendid results.

72 DE GRULLY & GASTINE.—(Action du sulfate de fer sur la chlorose de la vigne.)

Soc. Nationale d'Agr. de France 1894, Nov. 24.

Chloritic leaves contain excess of iron and silica over non-chloritic. Treatment with S. of I. diminishes iron in the leaves, and increases K_2O, Na_2O.

73 DEHÉRAIN, ( ).—Traité de Chimie agricole (1892), p. 480.

Claims S. of I. is a plant poison and quotes Voelcker.

74 DEHÉRAIN.—In Wurtz's Dictionnaire de chemie (1878), Tome III, p. 347.

75 DELACROIX, ( ).—Sur la Maladie des öeillets, produite par le Fusarium Dianthi Prill. et Delac.

Compt. Rend. Acad. Sci. (Paris), 1900, T. II, p. 961.

Ztschr. Pflanzenkrank. Bd. XI, S. 168.

Treat the soil with S. of I. and this only in soil free from lime, otherwise the Sulphate of Iron is decomposed.

76 DEMENTJEW-ARKADY, ( ).—Die Chlorose der Pflanzen und Mittel zur Ihrer Bekämpfung.

Ztschr. Pflanzenkrank., Bd. XIII, S. 321.

Considers the use of S. of I. valueless.

77 DENAIFFE & SIRODOT. — (Le Charbon — Ustilago carbo; U. Segetum—). L'Avoine, p. 701.

Soaked seeds in sulphate solutions. S. of I., 2-5 per cent, had the least value of the three salts used, viz.: S. of I., sulphate of soda, Sulphate of Copper.

78 DENAIFFE & SIRODOT.—(Destruction of Wild Radish and Wild Mustard.) L'Avoine, pp. 730-733.

10-12 per cent solution S. of I. employed when plants are small; 15 per cent solution when plants are large. Applied at the rate of 12 Hktl. per Hect. Two reasons for using S. of I., low cost and the favorable action on the growth of oats.

79 DESBOIS, ( ).—In Bernard's La Calcaire sa Determination et son Role dans les Terres arables. p. 219.

Also Revue horticole, 1888.

A bed of Maréchal-Niel roses being chloritic was condemned. Treated with S. of I., 100 grams to 10 Litres, the solution being applied to the roots. Treated three times at intervals of eight days. The bushes produced five or six roses of ochreous color. The vegetation was vigorous.

In 1889 the bushes produced 300 beautiful roses of the usual color.

Physico-chemical analysis of the soil gave:

Silica 67.3%
Calcareous 16.0%
Argillaceous and Organic Matters.....16.7%

80 DESTREMX, L.—Le sulfate de fer en agriculture.

Jour. Agr. Prat. 1888, No. 47, T. II, p. 747.

Plays a great role in vineyards.

Specific against Chlorosis, Anthracnose.

Successfully used to eradicate moss in pastures. Sulphate of Iron for roots with Sulphate of Copper for leaves makes the ideal combination.

81 DETMER, W.—Die natürlichen Humus körpen des Bodens und ihre landwirthschaftliche Bedeutung.

Landw. Vers. Bd., XIV, S. 292.

Reduction of ferric to ferrous compounds in sour humus soils.

82 DEVARDA, A.—Ein neues Geheimmittel gegen den Peronospora, "La Vitale."

Die Weinlaube, 31 Dec. (1899).

Centbl. Agr. Chem. Bd., XXXI, S. 648.

Compound composed of the Sulphates of Iron, Copper, Potash, Soda, with Carbonates of Lime and Soda, with the addition of a tarry substance.

83 DIEULAFAIT, ( ).—Dépôts de mer et d'eau douce au point de vue agronomique, suivant qu'ils sont on ne sont pas sulfurés; alluvions de la Durance.

Compt. Rend. Acad. Sci. (Paris), T. 98, p. 1007.

Sterility due to pyrites. This compound weathers and the soil becomes very fertile. Sulphuric acid is liberated, attacks the phosphates and produces the fertility.

84 DIETRICH, ( ).—( ).

Wagner's Jahresber. (1866), S. 273.

Combats the view that chlorophyll produces assimilation and claims it is protoplasma.

NOTE: This reference cannot be verified.

85. DONHOFF, P.—Erfahrungen betr. Vertilgung des Hederichs und Ackersenfs durch Bespritzen mit Eisenvitriollösung.

Deut. Landw. Presse. (1902), S. 357.

86 DRAPIER-GENTEUR, ( ).—Note sur un moyen préventif contre la fièvre aphteuse.

Jour. Agr. Prat., T. I, p. 405.

87 DUCLOS, ( ).—Le destruction de la moutarde sauvage.

Bul. Soc. Nationale d'Agr. de France, 9 Juni, (1897).

Jour. Agr. Prat. T. I, (1897), p. 862.

88. DUFOUR, J.—Badigeonnage de ceps.

Chron. Agr. Vaud. T. IX, (1896), p. 88.

89. DUFOUR, J.—Traitement de la chlorose ou jaunisse par le système Rassiguier.

Chron. Agr. Vaud. T. VIII, p. 468.

Solution of 4 Kgo. S. of I. in 10 litres water. Treatment in autumn (October) was successful, and the vines showed a remarkable vigor. While this autumnal treatment may appear singular, it was made with the view of introducing the iron salt into the plant before the sap ceased to flow.

90 DUFOUR, J.—Les badigeonnages des ceps de vigne.

Chron. Agr. Vaud. T. I, p. 13.

Successfully used 20-30 per cent and 50 per cent solutions against anthracnose. For preventative treatment 5-10 per cent solutions.

91 DUFOUR, J.—Traitements d'hiver contre l'öidium.

Chron. Agr. et Vit. T. II, p. 75.

Experiences of wine growers. Two solutions used. A. 6-10 per cent. S. of I. with 10 per cent Lime. B. 10-15 per cent. S. of I. with or without 1 per cent Sulphuric Acid.

92 DUFOUR, J.—Note sur le traitement de la chlorose ou jaunisse des plantes.

Chron. Agr. Vaud. T. IV. p. 223.

Ztschr. Pflanzenkrank. (1891), S. 136-137.

Recommends a mixture of,

S. of I.	3	Kgo
Lime	2½	"
Water	100	litres

A 2 per cent solution of S. of I. applied to the leaves burned them.

93 DUFOUR, J.—Essais de badigeonnage des ceps.

Chron. Agr. Vaud. T. IV, (1891), p. 41.

The following compound exercises a very good influence on vines:

S. of I.	3	Kgo
Lime	8	"
Water	100	Litres

94 DUFOUR, J.—Chlorose et sulfate de fer.

Chron. Agr. Vaud. T. X, (1897), p. 626.

Experiences of wine growers using solutions of varying strengths.

95 DUFOUR, J.—Badigeonnage des ceps dans les vignes très atteintes par l'öidium en 1896.

Chron. Agr. et Vit. du Cant. Vaud. T. X, (1897), p. 107.

Used Milk of Lime, Lime-Iron Spray, Sulphate of Iron, and recommends last two, made us as follows:

10 Kgo. Lime to 80 l. water.
6-10 Kgo. S. of I. to 20 l. water.
10-20 Kgo. S. of I. to 20 l. water.

96 DUFOUR, J.—Le sulfate de fer.

Chron. Agr. Vaud, T. IV, p. 237.

Le Cercle agr. de France discussed the question of the use of S. of I. in agriculture. Opinions were varied.

S. of I. renders service by acting as a stimulant or as some believe as a true nutrient.

It furnishes two useful substances to plants,—iron (Fe) and sulphuric acid (SO_3). It cannot replace potassium, phosphorous, nitrogen, but used with these substances, good results are obtained.

97 DUFOUR, J.—L'anthracnose ou noir de la vigne

Chron. Agr. Vaud., T. II, p. 51.

Two methods of treatment, preventative and curative. First practiced in winter, second in springt me.

As a preventative use 25-30 per cent solution S. of I., or 5 Kgo. Sulphate of Copper, 5 Kgo. S. of I. and 90 Kgo. water.

98 DUFOUR, J.—Traitement de la chlorose.
Chron. Agr. et Vit. T. XVI, p. 447.

Used two solutions, viz., 100 grams to 1 litre for underdeveloped vines, 200 grams per litre for well developed.

99 DUHAMEL.—Traité des Arbres (1765).

100 DUSSERE, M. C.—Vertilgung des Unkrautes in Getreideäckern.

Jour. d'Agr. Suisse, No. 23, June 5, (1900).

The use of a 15 per cent solution of S. of I. in form of a spray did not give good results.

101 EDLER, ( ).—Zur Vernichtung des Wilden Senfs und des Hederichs.

Deut. Landw. Presse (1899), S. 267, 659.

Jahres. Agr. Chem., Bd. 42, S. 352.

Solutions S. of I., 5-10 per cent strength, are useless. A 20 per cent solution is less efficacious than 2 per cent solution Sulphate of Copper.

102 EHLERT, W.—Versuche zur Vernichtung von Hederich mit Eisenvitriolösung und Eisenvitriolpulver.

Korrespondenzbl. der Landw. Kammer für die Provinz Ostpreussen, (1900).

103 ENGLER ( ).—(Destruction of Pathogenic Organisms in Human Excrement.)

In Lardenburg's Handwörterburch der Chemie, Bd, III, S. 183.

S. of I. does not destroy putrefactive germs.

104 FAIRCHILD, D. G.—Index to North American Mycological Literature.

Jour. Mycol, Vols. 6, 7 and 8.

105 FLEISCHER, M.—Die Natürlichen Feinde der Rimpauschen Moordammkultur.

Landw. Jahrb., (1886), S. 47.

The bad effects of pyrites which oxidizes to Sulphate of Iron.

106 FRANCK, ( ).—Hederichvertilgungsversuche im Frühjahr, (1903).

Landw. Wchnschr. Sachsen 8, (1904), S. 62.

Experiments made with "Unkrauttod" (Sulphate of Iron). Applied in the early morning when dew is on the leaves. For uniform distribution the powder is not behind the solution. Applied by hand 50 pfd. per morgen. is used; by machine, 25 pfd. per morgen.

107 FRANK, ( ).—Beiträge zur Bekämpfung des Unkrautes durch Metallsalze.

Arb. aus. d. Biol. Abt. d. Kais. Gesundamt. Bd. I, (1900), S. 127. Ztschr. Pflanzenkrank. Bd. XII, (1902), S. 188.

The destructive action of S. of I. and Sulphate of Copper on certain weeds is practically equal, hence the only question is that of cost.

The S. of I. is effective when used as a 15 per cent solution; the Sulphate of Copper at highest 5 per cent solution.

108 FREAR, WM.—Copperas or vitrol as a Weed Killer.

Press Bull. Penn. Exp. Station.

109 FÜNFSTÜCK, W.—Die Hederich-Bekämpfung durch Bespritzen mit Salzlösungen resp. durch Jätemaschinen.

Deut. Landw. Presse, Bd. XXIX, S. 233.

Answer to Hillman.

110 FÜNFSTÜCK, W.—Auf Welche Weise sind Hederich und Ackersenf in don Sommerkorn Saaten (Hafer, Gerste, Weisen) nach dem jetzigen Stande der Erfahrung in der Praxis rationell zu Vertilgungen?

Deut. Landw. Presse, Bd. XXIX, (1902), S. 165.

Recommends 20 per cent solution in quantities 200 l. per morgen at most.

111 GAGNIERE, F.—La chlorose dans les vignes de la cote d'Azur.

Jour. Agr. Prat. T. II, p. 728.

112 GALLOWAY, B. T.—Experiments in Treatment of Rusts Affecting Wheat and other Cereals.

Jour. Mycol., Vol. 7, No. 3, p. 195.

E. S. R., 4, 954.

Used 100-200 gr. S. of Iron in a 20-ft. row of Winter Wheat. Sprayed ground with solution (1.073 oz. to 2 gal.). Results very meagre.

Soaked seed for fifteen minutes in water at 132½°F. and applied 2 oz. of S. of I. to the 20-ft. row experimented upon.

Soaked seed 24 hrs. in 1:10 solution of S. of I. and sprayed soil before planting. Sprayed plants every ten days with a solution 4 oz. to the gallon.

Soaking the seed was valueless.

113 GALLOWAY, B. T.—Treatment of Black-Rot, Brown-Rot, Downey Mildew, Powdery Mildew, and Anthracnose of the Grape; Pear Scab and Leaf Blight and Apple Powdery Mildew.

Jour. Mycol., Vol. VI, p. 11.

114 GALLOWAY, B. T.—A New Pear Disease.

Jour. Mycol. Vol. VI, (1891), p. 157.

115 GALLOWAY, B. T.—A New Pear Disease.

Jour. Mycol., Vol. VI, (1891), p. 113.

Thelephora pedicellata Schw. Recommends cutting out diseased wood, washing the cut with solution of S. of I., and coating wound with wax. Treatment successful.

116 GALLOWAY, B. T.—Spraying for Fungous Diseases.

U. S. Dept. Agr., Farmers' Bul. No. 38, p. 11.

A wash made of,

S. of I.	6 Kgo
Sulphuric Acid	250 ccm
Water	100 l

Vines are washed during rest, and in no case should this preparation be used after growth starts.

117 GARMAN, H.—Injurious Insects and Fungi.

2nd Ann. Rpt. Ky. St., p. 38 and 41.

E. S. R. III, 859.

Spraying experiments with 2½-5 per cent solutions of S. of I. The weaker solution was the least effective. Surfaces sprayed were not wholly moistened. The method was not fairly tested. Sprayed for Brown-Rot of Plums, Peaches, Apples and Cherries. 5 per cent solution damaged leaves in every trial; 2½' per cent damaged leaves but slightly in two out of four experiments.

It is possible that the treatment can be useful in some cases, but in not stronger than 2 per cent solutions.

118 GARMAN, H.—The Brown Rot Fungus of Plums, Peaches, Apples and Cherries.

Ky. Agr. Ex. Sta. (1889), pp. 38 and 41. (Second Annual.)

Monilia fructigena, Pers. Spraying experiments with 2½ and 5 per cent solutions S. of I. The 5 per cent solution less effective than 2½' per cent, and this due probably to the repellant powdery coating. The 5 per cent solution damaged the leaves badly; the 2½ per cent injured them slightly. It is possible that S. of I. may be useful in some cases, but in not stronger than 2½' per cent solutions. Much of surfaces sprayed not moistened. Method not fairly tested.

119. GAROLA, C. V.—(Pyretic Cinders.)

Engrais (1903).

120 GASTINE, G.—Résultats du traitement de la chlorose dans le vignoble de M. F. Caire, à Roquefavour.

Prog. Agr. et Vit., 26, (1896), No. 37, p. 307.

E. S. R. VIII, 63.

Used 40 per cent solution S. of I. with success.

121 GAUTIER. A., & DROUIN, R.—Recherches sur la fixation de l'azote par le sol at les végétaux.

Compt. Rend. Acad. Sci., (Paris), (1888), 106, pp. 754-57; 863-66; 944-47; 1098-1101; 1174-76; 1605-07.

122 GERLACH, M.—Lässt sich durch Eisenvitriol Hederich Vertilgung?

Jahresber. Vers. Stat. Posen, (1899-1900).

Jahresber. Agr. Chem., Bd. 43, S. 353.

Once spraying with 15-20 per cent solution of little use.

123 GERLACH, M. & VOGEL.—Versuche mit dem Stalldünger-Konservierungsmittel. Patent Dr. Rippert.

Fuhling's Landw. Ztg., Bd. 52 (1903), S. 409.

Centbl. Agr. Chem., Bd. 33, S. 80.

Reported valueless. Contained small quantity S. of I.

124 GHIRADI, A.—L'anthracnosi e il solfato di ferro.

Italia agr. xxviii, (1891).

Ztschr. Pflanzenkrank. (1891), S. 302.

Claims 2 per cent burnt and recommends 0.5 per cent as all that is required.

125 GIGLIOLI, L.—Fermenti e Microbi, (1887), p. 511.

126 GILTAY, E.—(Experiments with Copper Lime and Iron Lime solutions used against Potato Diseases.)

Niederlandsch. Landbouw. Weekblad. (1892), No. 22.

Centbl. Agr. Chem., (1892), S. 851.

Used for combatting potato disease and without success. Used a mixture of 1 Kgo. S. of I., ½ Kgo. Lime, 100 l. water. Yield on sprayed field 8,500 Kgo., on unsprayed field 8,900 Kgo.

127 GIRAUD, M.—(Treatment of Chlorosis in Summer.)

Rev. Vit., T. VI, (1896), No. 136.

Centbl. Agr. Chem., Bd. 26, S. 202.

Stalks cut and wound bathed with 40 per cent solution S. of I.

128 GIRONDE. ASSOC. VITICOLE DE LIBOURNE.—(Phylloxera).

Le Phylloxera, An. III, (1879), p. 65.

A fertilizer to be used in connection with an insecticide:

Dried Blood	100 Kgo
Superphosphate Lime	250 "
Sulphate Potash	250 "
Sulphate of Iron	50 "

Used 650 Kgo. per hectare.

130 GOETHE, R.—Untersuchugen von mit Eisenvitriol gedüngten Reben.

Ber. K. Lehranst. Wein, Obst u. Gartenbau Geisenheim, (1891-92), S. 48.

Zetschr. Pflanzenkrank., Bd. III, S. 179.

The practice of using 2 Kgo. S. of I. per vine showed to disadvantage in case of hot house experiments. The injurious action first became evident the second year, and this after the vines had been watered with warm water in Feb. and Mar. The leaves rolled up and the whole plant stopped growing. In the summer the vines recovered their normal condition and growth. (This was to be expected).

131 GOETHE, R.—Eisenvitriol als Heilmittel der Gelbsucht der Obstbäume.

Ber. K. Lehranst. Wein, Obst u. Gartenbau Geisenheim, (1889-90), S. 30.

Successfully used. Small trees received 1 Kgo., large trees 2 kgs. Either there are trees requiring more iron or there are trees more inclined to Chlorosis. Treated trees were less attacked by the leaf Aphis & Schizoneura.

132 GOETHE, ( ).—(Chlorosis of Grape Vines.)

Pomal. Monatsch. (1891), Heft. II.

Centbl. Agr. Chem. (1891), S. 30.

For small trees used 1 Kgo. (2 lbs., 3 oz.), for large trees 2 Kgs. (4 lbs. 6 oz.) S. of I. to a tree. Applied by strewing in a trench 8 in. wide and 10 in. deep, circling around the stem of the tree at distance of 20 to 40 inches away from the stem. Sprinkled the salt with water and covered with soil.

133 GRAFTIAU, J.—Le chimie et la lutte contre les mauvaises herbes armes nouvelles à la disposition des cultivateurs.

Ingén. Agr. Gembloux, An. 10, (1900), p. 413.

134 GRANDEAU, L.—Destruction de la cardamine des prés par le sulfate de cuivre. Nécessité de substituer le sulfate de fer au sel de cuivre.

Jour. Agr. Prat. T. I, (1900), p. 742.

Used a 15 per cent solution S. of I. for the destruction of Cardamine pratensis (Cuckoo-Flower).

135 GRANDEAU, L.—La fumure des vignes.

Jour. Agr. Prat., (1897), T. II, p. 854.
Experiments made on old vineyards.
Surface soil a calcareous loam containing lumps of carbonate; subsoil calcium carbonate.
Used the following mixture:

Thomasslag	250 Kgo
Chloride Potash	100 "
Sulphate of Iron	150 "

Result successful.

136 GRANDEAU, H. M.—Etudes agronomique, I re Serie, p. 127.

137 GRANDEAU, L.—Remarques sur les expériences de M. Pagelot.

Jour. Agr. Prat., T. II, (1895), p. 337.

138 GRANDEAU, L.—Expériences nouvelles sur la destruction des Sanves.

Jour. Agr. Prat. (1900), T. I, p. 525.
E. S. R. 12, p. 351.
Used 12½' per cent solution S. of I., 200 litres to acre, applied for the destruction of the weed in Wheat fields. Destroyed Charlock, Mustard, Wallflower, Ground Ivy. Did not injure cereals, clover, colza and lupines.

139 GRIFFITHS, A. B.—On the application of Iron Sulphate in Agriculture, and its Value as a Plant Food.

Jour. Chem. Soc., (London), Vol. 47, (1885), p. 46.

140 GRIFFITHS, A. B.—Chemico-Microscopical Researches on the Cell Contents of Certain Plants.

Jour. Chem. Soc. (London), Vol. 43, (1883), p. 195.

141 GRIFFITHS, A. B.—Experimental Investigations on the Value of Iron Sulphate as a Manure for Certain Crops.

Jour. Chem. Soc., (London), Vol. 45, (1884), p. 71.

142 GRIFFITHS, A. B.—On Some Physiological Experiments with Iron Sulphate on Plants.

Chem. News, Vol. L, (1884), p. 193.
When plants have absorbed iron to the extent of yielding an ash containing 10 per cent Fe2 03 they died.

143 GRIFFITHS, A. B.—On the use of Ferrous Sulphate in Agriculture.

Jour. Chem. Soc., (London), Vol. 49, (1886), p. 714.

144 GRIFFITHS, A. N.—Agricultural Experiments with Iron Sulphate during 1886.

Jour. Chem. Soc., (London), Vol. XVI, (1887), p. 215.

145 GRIFFITHS, A. B.—Researches on the Growth of Plants under Special Conditions.

Chem. News, Vol. XLVII, (1883), p. 27.

Experiment on Cabbages.

146 GRIFFITHS, A. B.—Iron Sulphate as a Manure.

Chem. News Vol. 51, (1885), p. 60.

147 GRIFFITHS, A. B.—Notes on the Use of Iron Sulphate in Agriculture.

Chem. News, Vol. LVI, (1887) p. 84.

148 GRIFFITHS, A. B.—Farmyard Manure—A Medium for the Development of Parasitic Diseases.

Chem. News. XLIX (1884), p. 279.

149 GRIFFITHS, A. B.—Researches on the Vitality of the Spores of Parasitic Fungi, and the Antiseptic Properties of Ferrous Sulphate.

Chem. News, Vol. LIII, (1886), p. 255.

0.1 gr. S. of I. in 100 gr. of water destroyed Peronospora infestans.

0.1 gr. S. of I. in 100 gr. water destroyed Wheat Mildew.

150 GRIFFITHS, A. B.—On the Destruction of Parasitic Fungi by Using Iron Sulphate.

Chem. News, Vol LV, (1887), p. 277.

151 GRIFFITHS, A. B.—Iron in Chlorophyll.

Chem. News, Vol. L, (1884), p. 32.

152 GRIFFITHS, A. B.—Special Manures for Garden Crops.

153 GRIFFITHS, A. B.—A Memoir detailing some Minor Researches on the Action of Ferrous Sulphate on Plant Life.

Chem. News. Vol. L, (1884), p. 167.

A. 0.20 per cent solution prevented the germination of Mustard.

B. 0.15 per cent solution grew large and healthy plants.

C. 0.10 per cent solution plants grew well but not as well as in "B."

D. 0.05 solution plants grew well but not as well as in "B."

153a GRIFFITHS, A. B.—On a Fungus Disease in the Roots of Cucumis sativa.

Proc. Roy. Soc. Edin. Vol. XV., (1888), pp. 403-410.

Nodular growths on the roots of the cucumber due to the fungus Ustilago cucumis. The spores and hyphae of this fungus are destroyed by Sulphate of Iron.

Cucumber seed soaked in a one-tenth per cent solution of SofI and the soil watered with the same strength solution before the seed was planted, fungus did not develop.

When the disease had taken fairly hold of the plants treatment with SofI completely destroyed the fungus and this without injury to the cucumber plants.

153b GRIFFITHS, A. B.—The Diseases of Crops and their Remedies. G. Bell & Sons, London.

154 GRIS, E.—D'l'action d. compos. ferrug. s. l. vegetation, 1843 u 1844.

155 GRIS, A.—Recherches miscroscopiques sur la chlorophylle.

Annal. d. Scienc. naturell., (1857), IV. Ser., T. 7, p. 201.

Completing the work of his father.

156 GUILLAMONT, A.—Essai de lutte contre le phylloxera.

Jour. Agr. (Paris), T. I, (1883), p. 73.

Centbl. Agr. Chem. (1883), S. 272.

Used for many years with good results
a "fertilizer insecticide" composed of:

S. of I.	10 parts
Wood Ashes	10 "
Coal Tar	2 "

157 GUILLON, J. M.—Experiments in the Treatment of Chlorosis.

Prog. Agr. et Vit. 12 (1895), No. 42, p. 408.

E. S. R. 7, 411.

S. of I. applied immediately after pruning gave best results. Recommends 40-50 per cent solution.

158 GUILLON, J. M.—Experiments in the Treatment of Chlorosis.

Prog. Agr. et Vit. 12, (1895), No. 25, p. 653.

E. S. R. 7, 225.

S. of I. gave good results.

159 GUILLON, J. M.—Influence des badigeonnages sur l'epoque du débourrement de la vigne.

Rev. Vit. T. V., p. 511.

160 GUILLON, J. M.—Les badigeonnages au sulfate de fer et les systèmes de taille.

Rev. Vit. T. V., p. 149.

161 GUILLON, J. M.—Resultats obtenus á l'aide du traitement Rassiguier.

Rev. Vit., (1896), p. 458.

Recommends 20-25 per cent solution for young vines; 30 per cent solution for old vines. Thinks 50 per cent solution has harmed vines and brought discredit on treatment.

162 GUILLON, J. M.—Experiences sur le traitement de la chlorose.

Jour. Agr. Prat. T. I, (1896), p. 883.

Successfully used S. of I. and citrate of iron. The latter not as good as the sulphate.

163 GUILLON, J. M.—Expériences sur le traitement de la chlorose.

Jour. Agr. Prat. (1895), T. I, p. 928.

Commission named by Soc. centr. d'agri., l'Herault.

Experimented with S. of I. and citrate of iron, both treatments being successful, but price of citrate is prohibitive. Effect of S. of I. less marked when applied in the springtime.

164 GUIRAND, ( ).—(Treatment of Chlorosis).

Rev. Vit. (1894), No. 25.
Sprinkled 10 l. of 5 per cent solution on stems.
Treatment requires more time, but is better than spraying leaves.

165 GUOCDENOVIĆ, FR.—Bekämpfung von Pflanzenkrankheiten und Schadlingen.

Ztschr. Landw. Versuchsw. Oestrr. (1901).

In treatment of Peronospora and Oidium by spraying, the addition of S. of I. to the copper spray produced no added benefit.

166 GUOCDENOVIĆ, FR.—(Treatment of Anthracnose.)

Bericht über die Thätigkeit der K. Landw. chemischen Versuchstation in Spalato im Jahre 1901.

Ztschr. Landw. Versuchsw. Oestrr. (1902), S. 20.

In Island of Brazza, vines attacked with anthracnose treated with concentrated Sulphate of Iron solutions partly or wholly perished. This due to the practice of cutting back and sprinkling too strongly.

167 GUTZEIT, E.—Bekämpfung des Hederichs un der andern Unkräuter durch Eisenvitriollösung und Hederichtod.

Korrespondensbl. d. Landw. Kammer d. Provinz Ostpreussen.
Ztschr. Pflanzenkrank. Bd. 12, S. 317.

168 GUTZEIT, E.—Feldversuche zur Bekämpfung von Pflanzenkrankheiten und Unkrautern.

Correspondenzbl. d. Landw. Kammer d. Prov. Ostpreussen.

Ztschr. Pflanzkrank. Bd. XI, S. 153.

A 15 per cent solution S. of I. destroys charlock and other weeds.

169 GWALLIG—Zur Vertilgung von Hederich und Ackersenf mit Eisenvitriol.

Deut. Landw. Presse. No. 42. (1898). S. 463.

7-10 per cent solutions of S. of I. will eradicate charlock. Stronger solutions injure barley, and in one instance barley was injured by 7½ per cent solution.

170 HABERHAUFFE, M.—Über die Hederich vertilgung mittels Eisenvitriol.

Ztschr. Landw. Sachsen.

Fühling's Landw. Ztg., (1899), S. 238.

171 HALL, A. D.—The Soil—An Introduction to the Scientific Study of the Growth of Crops.

172 HAGLUND E. & H. VON FEILITZEN.—Om ograesets utrotande genom besprutning med jærnvitriol.

Svenska Mosskulturfor. Tidskor., 18 (1904), No. 6, pp. 413-420.
F. S. R. 16, p. 1091.
Preliminary experiments on moor soils showed that the spraying method furnishes an effective means of checking if not killing many weeds growing on such soils.

173 HALSTED, B. D.—Experiments on Cranberry Diseases.

Ann. Rpt. N. J. Sta., (1890), pp. 321-453.
E. S. R., 3, 306.
Results undecided. 3-20 lbs. S. of I. per sq. rod killed vines.

174 HANDTKE, .( ).—(Hederichvertilgung).

Ztschr. Landw. Kammer Prov. Schlesien, (1898), S. 909.
Lupines and Serradella suffered injury.

175 HANSEN, J.—Anbauversuche mit verschiedenen Kulturpflanzen (Vertilgung des Hederich durch Verspritzen).

Deut. Landw. Presse, (1903), No. 1, S. 4.
Centbl. Agr. Chem., Bd. 33, S. 69.
A 15 per cent solution S. of I. gave very successful results.

176 HAYWARD, A. I.—Soil Test with Corn.

Md. Exp. Sta. Fourth Ann. Rpt. (1891), p. 357.

177 HEBERT, A. & G. TRUFFANT.—Sur l'emploi des engrais en horticulture.

Compt. Rend. Acad. Sci. (Paris), T. 126, (1898), p. 1831.

178 HEIDEN, E.—(Danger of Ferrous Oxide to Plant Life).

Lehrbuch der Düngerlehre, Bd. I, S. 562.
A soil contained 0.97 per cent ferrous oxide. The roots and leaves of beets grown on the soil contained .003 per cent. Beets did poorly, the average weight per beet being 15 gr. and the foliage 12 gr.
The soil behaved in the same manner toward Rape, Wheat and Clover.
Kraut and Kohlrabi not affected.
Neither the Beets nor the other plants contained an unusual amount of iron oxide.

179 HEIMERL, ANTON.—Zur Beseitigung der Chlorose.

Wiener Illus. Gart. Ztg., 16 Jahrg., (1891), S. 331-335.
Quotes Sachs' experiments.

180 HENRICH, ( ).—Neue Mittel zur Vertilgung von Hederich und Ackersenf.

Deut. Landw. Presse, (1900), S. 666.
Use of fertilizers to be preferred to S. of I. e. g. Chilisaltpeter, ammonium sulphate, chloride potash (40 per cent).

181 HILLMANN, P.—Die Bekämpfung des Hederichs durch Bespritzung mit Salzlösungen.

Mitt. Deut. Landw. Gesell., 18, (1903), S. 80.
Jahresber. Agr. Chem. 46, S. 249.
Centbl. Agr. Chem., Bd. 32, S. 463.
A 15 per cent solution of S. of I. applied at the rate of 400-500 l. per hectare gave the best results. If dew is on the leaves the spraying will do no good. Clover is as little injured as cereals.

182 HILLMANN, P.—Die Ergebnisse der Umfrage betr. die Unkrautvertilgung.

Deut. Landw. Presse, Bd. XXIX. S. 416.
Use of molasses with S. of I. for plants with smooth leaves. A preliminary experiment with thistles apparently successful.

183 HILLMAN, P.—Die Ergebnisse de Umfrage Vetreffend die Unkrautvertilgung.

Jahrb. Deut. Landw. Gesell., (1902), S. 184.

184 HILLMANN, P.—Die Hederichbekämpfung durch Bespritzen mit Saltzlösungen.

Deut. Landw, Presse, Bd. XIX, S. 214.

185 HILLMAN, P.—Die Bekämpfung des Hederich durch Bespritzen mit Salzlösungen.

Mitt. Deut. Landw. Gesell. (1903), No. 16, S. 80, 84.

186 HILLMANN, P.—Die Bekämpfung des Hederichs durch Bespritzen mit Salzlösungen.

Mitt. Deut. Landw. Gesell., (1902), S. 24.
Thistles injured but some recovered. Very few Clover plants killed, i. e., Trifolium species. With Medicago species (Luzerne and Yellow Clover) more killed. Lupines blackened but, not permanently injured.

187 HITIER, H.—Nouveau procédé de destruction de la moutarde sauvage.

Jour. Agr. T. I, (1897), p. 705.

188 HITIER, H.—Destruction des Sanves.

Jour. Agr. Prat. T. I, (1899), pp. 98-160.

Duclos recommends two applications of a 15 per cent solution, or one application of a 20 per cent solution.

189 HITIER, H.—Destruction des sanves.

Jour. Agr. Prat., n. ser. 5 (1903), p. 658.

E. S. R. 15, p. 266.

Should be sprayed when the young plants have developed two or three leaves only, for then the plants are easily killed with the use of a minimum amount of solution and with the least harm to the field by the horse and the spraying machine wheels.

190 HOFFMAN, H.—Culturversuche.

Bot. Ztg., (1875), S. 622.

191 HOFFMAN, M.—Vertilgungversuche von Ackerunkräutern.

Thüringer Landw. Ztg., (1903), No. 6.

Centbl. Agr. Chem., Bd. 33, S. 69.

S. of I. solutions worked the surest of all salts tried. Rape suffered by spraying.

192 HOLLRUNG, M.—Handbuch der chemischen Mittel gegen Pflanzenkrankheiten. (1898).

193 HORNSBY, J.—Laxton Park Experiments on Charlock Spraying, 1899.

Agr. Gaz. (London), Vol. 50 (1899), p. 232.

E. S. R. 11, p. 461.

On Barley fields 7½ to 10 per cent solutions S. of I. applied at the rate of 32-40 galls. per acre were not effective.

194 HOUDAILLE, F. & L. SÉMICHON.—Étude de l'état physique, du calcaire considéré comme cause déterminante de la chlorosis.

Rev. Vit. T. I. pp. 405, 455, 509.

195 HUBBARD, E. S.—Fertilizers and Irrigation.

Fla. Sta. Hort. Soc. (1903), p. 74.
"Iron, as Sulphate of Iron, has a tonic effect on some crops making the foliage look green. It may be noticed on hardpan land when Sulphate fertilizers are used.
The Irish potato will keep green longer on such spots than other parts of the field but will yield poorly, evidently from lack of available Phosphoric Acid, though complete fertilizers are used."

196 HUNTER, J. J.—(Growing Roses.)

In Griffith's "A Treatise on Manures," p. 200.
Lincolnshires Chronicle, Nov. 16, 1886.
Obtained good results with S. of I. on rose bushes.

197 JENSCH, ED.—Über die Allmähliche anreicherung des Bodens an Eisen bei Anwendung Künstlicher Düngemittel.

Chem. Ztg. XI, (1887), S. 136.
In 600 years soil fertilized with Thomasslag meal will contain 1 per cent iron!

198 JOST, L.—(Iron a nutrient or stimulent?)
Vorlesungen über Pflanzenphysiologie, (1904), S. 104-108.
In general it is not difficult to differentiate between a nutrient and a stimulant. In the case of iron the greatest difficulty is encountered for iron behaves both as a stimulant and nutrient.

199 JÖSTING, ( ).—Die Vertilgung des Hederichs durch Bespritzen mit Eisenvitriollösung.

Sächs. Landw. Ztschr. (1900), S. 174.
Jahresber. Agr. Chem., Bd. 43, S. 352.
A 15 per cent solution S. of I. proved sufficient, though 20 per cent solution did no harm to Oats.
The younger the Charlock, the easier it is destroyed.

200 JOULIE & DESBORDES.—Les Engrais en Horticulture.

Two formulas recommended for trees and shrubs in general, at the time of planting and during the following years:

		Qr.	Lbs.
In autumn—	Superphosphate Lime	3	26.23
	Potassium Chloride	1	16.09
	Sulphate Ammonium	3	4.18
In spring—	Superphosphate Lime	3	26.33
	Potassium Nitrate	1	22.00
	Sodium Nitrate	2	4.62

9-11 lbs. Sulphate Iron used as soil was calcareous.
4-6 lbs. for large trees applied in 1.3 cu. yds. soil.
12 oz. per sq. yd. for planted trees. Surface covered by leaves.
9 oz. per sq. yd. on groups of shrubs. Sown on surface.

201 JOURNEE, C. (Destruction of Charlock by Spraying with Solutions of Iron and Copper Sulphate.)

Agronome, 1899, p. 435.

E. S. R. 12, p. 351.

202 KEISER, ( ).—Zur Frage des richtigen Zeitpunktes zur Hederich—Vertilgung.

Nass. Landw. Zetschr. (1899), S. 252.

Charlock need not be sprayed with S. of I. solution at too early stage for the weed is injured even when in bloom.

203 KELLNER, O.—Untersuchungen über die Wirkungen des Eisenoxyduls auf die Vegetation.

Land. Vers. Stat. (1886), S. 365-370.

204 KING, WM. R.—Mal di Goma.

Bul. No. 4, U. S. Dept. Agr., Division Pomology, (1891), p. 18-19. Quotes from M. E. Gillett, Florida, recommending a mixture of

1 pk. Fresh Lime,
4 lbs. Sulphate of Iron,
5 lbs. Sulphur,
1 gal. Carbolic Acid (crude).
Water to slake the lime.

A reasonably effective mixture applied to fruit trees on pine lands. While does not always cure, it has checked the disease.

205 KLEBS, G.—Ueber die Organisation der Gallerte bei einigen Algen und Flagellaten.

Untersuchungen aus dem botan. Institut zu Tübingen Bd. II., S. 383.

Demonstrated the iron content of Closterium species. (Didymotocum angustatum, striolatum).

206 KLOCKE, E.—Hederichvertilgung mit Eisenvitriol und die Syphoniaspritze.

Fühling's Landw. Ztg. 1898. S. 625.

Experimented with Oats using a 25 per cent solution and 60 litres per Morgen. The charlock was in bloom and had overgrown the Oats. Charlock was killed and the oat plants slightly touched but recovered and grew with unexpected vigor.

207 KNOP, W.—Über die Ernährung der Pflanzen durch wässrige Lösungen bei Ausschluss des Boden.

Landw. Vers. Stat., Bd. II, S. 73.

To 1 l. water was added:

.005 .03 .05 gr. S. of I. and
.005 .03 .05 gr. Ferrous Phosphate.

The plants were killed by the solution 0.05 gr. of ferrous salt, and this probably due to the absorption of oxygen.

Used mixture of ferric phosphate, basic ferric sulphate and basic ferric acetate.

Ferric salts not poisonous.

208 KNOP, ( ).—Kreislauf d. Stoffes (1868), S. 614.

Also Ber. d. Sachs. Gesell. d. Wissensch. zu Leipsig, Bd. 25 (1869), S. 8.

Use of potassium ferrocyanide.

209 KNOP, W.—Quantitative Arbeiten über den Ernährungs process der Pflanzen.

Landw. Vers. Stat., Bd. V, S. 99.

An answer to the question—"Is iron necessary to the nutrition of plants?" Found that a small quantity of iron appears to be necessary for the continuation of plant growth.

210 KÖNIG, J.—Mittheilung uber die, Veränderungen von Kochsalz, u. Schwefelsaurem Zinklösungen bei Rieselversuchen.

Landw. Jahrb. Bd. XII, (1883), S. 37.

211 KÖNIG, J.—Nachtrag zu vorstehenden Versuchen über den schadlichen Einfluss von Kochsalz und zinkhaltigem Wasser auf Boden und Pflanzen.

Landw. Jahrb., Bd. 12 (1883), S. 837.

S. of I. on filtering into soil breaks up into basic ferric sulphate and free sulphuric acid, which latter acts on materials in the soil, causing them to dissolve. Action for most part is on calcium and potassium compounds. The soil may become contaminated by large quantities of hydrated ferric compounds, the pores stopped, the supply of oxygen cut off, in which case a gradual souring of the soil may result.

212 KRAUS, C.—Nochmals zur Vertilgung von Hederich durch Bespritzen mit Eisenvitriollösung.

Deut. Landw. Presse, (1899), S. 659.

Jahresber. Agr. Chem. 42, S. 351.

Results doubtful.

213 KRÜGER, F.—Aufruf zum Kampf gegen das Unkraut, mit besonderer Berücksichtigung der Eisenvitriolbespritzen.

Wochenbl. d. Landw. Vereins in Bayern, (1904), S. 486.

A 15 per cent solution S. of I. applied at the rate of 400-500 l. per ha.

214 KUNTZE-DELITZSCH, L.—Vertilgung des Hederichs mittels Eisenvitriollösung.

Ztschr. Ver. Deut. Zuckerindus. (1899), S. 699.

A 15 per cent solution S. of I. applied in form of a spray at the beginning of flowering is effective; applied later, ineffective.

215 LAMBIN, ( ).—Effets du Sulfate de fer en Agriculture.

Bul. Soc. Hort. de Soissons, (1888).

216 LARBALÉTRIER, A. & L. MALPEAUX.—Note sur l'action des engrais magnésiens et du sulfate de fer.

Ann. Agron., T. 22, (1896), p. 20-32.

Jahresber. Agr. Chem., N. F., Bd. 39, S. 241.

Experiments made applying S. of I. to soil at the rate of 150 Kgo. per hectaire. Soil was composed of—

Quartz sand	50.00
Clay	9.70
Humus	5.30
Nitrogen	.17
Phosphoric Acid (P_2O_5)	.135
Potash (K_2O)	.22
Magnesia	.21

The results were indefinite as a rule. The starch content appeared to be reduced in potatoes, and the sugar content increased in beets.

217 LARBALETRIER, A.—Les Engrais et la fertilizer du sol. Paris, 1891, p. 329.

218 LECLERCQ, E.—Sur la valeur fertilisante du sulfate de fer.

Cercle Études des Agron. (Brussels) Bul. 8. p. 360.

Destroyed Wild Mustard completely. Vigorous growth of the useful plants sprayed noted. Yield was increased. Found that 250 kgo. S. of I. produced as great an effect on Oats as 150 kgo. Nitrate of Soda. Ascribes the benefits to the iron alone and not to the Sulphuric Acid. A number of experimenters had the same result.

219 LESNE, A.—Traitement préventatifs contre l'anthracnose.

Jour. Agr. Prat., (1890), T. I, p. 217.

220 LINOSSIER, G.—Sur une hématine végétale. L'Aspergilline, pigment des spores de l'Aspergillus niger.

Compt. Rend. Acad. Sci., (Paris), T. 112, (1891), p. 489.

221 LODEMAN, E. G.—The Spraying of Plants (1896).

222 LOEW, O.—Über Reizmittel des Pflanzenwachstums und deren praktische Anwendung.

Landw. Jahrb., (1903), B. 32, S. 437.

Centbl. Agr. Chem., Bd. 33, S. 91.

223 LOEW, O.—The Physiological Rôle of Mineral Nutrients.

U. S. Div. Veg. Path. Bul. Vol. XVIII, (1899), (Iron p. 15).

It is to be expected that a moderate manuring with iron salts would prove beneficial for plants grown on soil deficient in Iron.

224 LOUET, C.—Un effet du traitement par le sulfate de fer des vignes chlorosées.

Jour. Agr. Prat. (1896), T. II, p. 232.

Remarks on Menudier's article.

Used a wash of,

S. of I.....50 Kgo
Water .....50 "

Claimed to be incontestibly a remedy of great efficiency.

225 LOUIS, THEODORE.—Corrective for Swine.

Farm, Stock and Home, July 15, 1894.

"Take 6 bushels of this cob charcoal, or 3 bushels of common charcoal; 8 pounds of salt; 2 quarts of air-slacked lime; 1 bushel of wood ashes. Break the charcoal well down with shovel or other implement, and thoroughly mix. Then take 1¼ pounds of copperas and dissolve in hot water, and with an ordinary watering pot sprinkle over the whole mass and then again mix thoroughly. Put this mixture into the self-feeding boxes, and place them where hogs of all ages can eat of their contents at pleasure."

226 LÜDECKE, ( ).—(Hederichvertilgung).

Zetschr. Landw. Kammer Schlesien, (1898), S. 721.

227 LÜDECKE, ( ).—Ein neue Methode zur Vertilgung des Hederichs.

Ztschr. Landw. Kammer Schlesien, (1897), S. 745.
Jahresber. Agr. Chem., Bd. 40, S. 406.
A 10 per cent solution S. of I. kills Charlock and does not injure Oats and Clover.

228 LÜDECKE-MAINZ, ( ).—Über die Verwendung von Eisenvitriol als Heilmittel der Gelbsucht der Weinstöcke.

Landw. Ver. Ztschr. f(Hessen, (1893), 7 u. 8.
The richer the soil in lime the more S. of I. may be used without injury. The products of the reaction between the lime and S. of I. (ferric oxide, calcium sulphate and carbonic acid,) have a beneficial effect on plant growth.

229 MACALLUM, ( ).—On the Demonstration of the presence of Iron in Chromatin by Microchemical Methods.

Proc. Roy. Soc., (London), Vol. 50, (1892), pp. 277-286.
Bot. Centbl., Bd. 55, (1893), S. 138.

230 MAECKER, M.—( ).

Ztschr. des landw. Centralvereins f. d. Provinz Sachsen, (1874), Nos. 2, 3, S. 70.
In work on moor soils it was shown that the presence of Sulphate of Iron means the absence of nitric acid.
One hundred parts of dry soil contain,

Nitric acid.	Soluble Iron.
0.0956	0.0
0.0	1.349
0.0088	0.298

231 MAIER, ( ).—Zur Frage der Vertilgung des Hederich (Dills) durch Chilisaltpeterlösung.

Wchnbl. Landw. Ver. Bayern, (1901), S. 501.

A 15 per cent solution S. of I. applied at the rate of 150 l. per ¼ ha, gave good results, even when the weed was in bloom.

232 MAIER, ( ).—Vertilgung des Hederichs, (Dill).

Wchnbl. Landw. Ver. Bayern, (1902), S. 263.

233 MAIER, ( ).—Beiträge zur Hederichvertilgung.

Wchnbl. Landw. Ver. Bayern, (1903), S. 101.

234 MAIZIERES, ( ).—Produits chimiques et mauvaises Herbes. Nouvel emploi du sulfate de cuivre. Nos expériences. Nos formules.

L'Engrais, 1897, p. 540.

The author experimented with the following solutions:

A. A solution of 5 per cent sulphate of copper.

B. A solution of the following:
3 per cent sulphate of copper;
2 per cent sulphate of iron;
0.5 per cent sulphuric acid.

C. A solution of the following:
2 per cent sulphate of copper;
3 per cent sulphate of iron;
0.5 per cent sulphuric acid.

The three formulae given had practically the same action.

235 MANGIN, L.—La lutte contre les maladies parasitaires, (Naptholate de fer).

Rev. Vit., T. 5, p. 486.

236—MARGOTTET, J. C.—Résumé des recherches de Griffiths sur l'emploi du sulfate de fer en agriculture.

Ann. Sci. Agron. 1887, T. 2, pp. 379-390.

237 MARCHAL, E.—Immunisierung der Pflanzen gegen parasitäre Pilze durch Absorption pilztötender Stoffe.

Ztschr. Pflanzenkrank., Bd. 13, S. 243.

A solution 5/10000 S. of I. did not prevent the development of Bremia Lactucae.

238 MARGUERITE-DELARCHOLONNY, P.—(Sulphate of Iron as an Insecticide).

Jour. Agri. Prat. 15 T. II, 710-711.

Claims a 1 per cent solution is useful in killing grape-vine insects.

239 MARGUERITE-DELARCHARLONNY, P.—Effets du sulfate de fer sur les betteraves.

Sucr. Indig. et Colon, T. XXXI, (1888), p. 571.

240 MARGUERITE-DELARCHARLONNY, P.—Destruction des larves d'insectes par le sulfate de fer.

Jour. Agr. Prat. T. II, (1890), p. 565.

241 MARGUERITE-DELARCHARLONNY, P.—La chlorose et le sulfate de fer. Comparison entre le mode d'emploi aux feuilles et aux racines.

Jour. Agr. Prat., T. II, (1890), pp. 241-243.

242 MARGUERITE-DELARCHARLONNY, P. — Effets utiles du sulfate de fer en agriculture.

Jour. Agri. (Paris), May-June (1887).

243 MARGUERITE-DELARCHARLONNY, P.—Le fer dans la vegetation.

Jour. Agri. Prat., (1888).

244 MARGUERITE-DELARCHARLONNY, P.—Mélange de sulfate de fer et de phosphates minéraux.

Jour. Agri. Prat., T. I., (1889), p. 536.

245 MARGUERITE-DELARCHARLONNY, P.—(Die Zerstörung der Kleeseide durch Eisensulfat.)

Jour. Agr. T. I, pp. 182-187; 223-227.

246 MARGUERITE-DELARCHARLONNY, P.—Suppression de la Maladie des Pommes de Terre par le sulfate de fer.

Jour. Agr. Prat. T. I, (1889), p. 126.

247 MARGUERITE-DELARCHARLONNY, P.—La destruction des mousses par le sulfate de fer.

Jour. Agr. Prat. T. II, (1888), p. 637.

248 MARGUERITE-DELARCHARLONNY, P.—Augmentation des recoltes par le sulfate de fer en 1887-88.

Jour. Agr. Prat. T. II, (1888), p. 905.

A long list of experiments quoted.

249 MARGUERITE-DELARCHARLONNY, P.—Effets du sulfate de fer sur differents terrains en 1887 et 1888.

Jour. Agr. (Paris), T. II, (1888), pp. 787-790.

250 MARGUERITE-DELARCHARLONNY, P.—La chlorose et le sulfate de fer terrains à chlorose sinéferruese.

Jour. Agr. Prat. T. I, (1890), p. 851.

Composition of soils on which Chlorosis occurred.

251 MARGUERITE-DELARCHARLONNY, P.—Époque de l'emploi du Mélange de phosphate de chaux et de sulfate de fer.

Jour. Agr. Prat., T. I, (1889), p. 633.

252 MARGUERITE-DELARCHARLONNY, P.—Destruction economique des Sénés, Sanves, Moutardes Sauvages, Moutardelles, Ravenelles.

Engrais (1897), p. 782.

A 15% S. of I. solution applied at the rate of 800—1000 l. per Hectare.

253 MARGUERITE-DELARCHARLONNY, P.—La chlorose et le sulfate de fer. Son emploi sur les feuilles.

Jour. Agr. Prat. (1890), T. II, p. 115.

Makes the following references:

Narbonne, P.—Bul. agr. du Midi (5 Mai 1889).
Rouget, P.—Le Petit Paysan.
Canvet, S.—Bul. agr. du Midi.

254 MARGUERITE-DELARCHARLONNY, P.—Le sulfate de fer et les maladies de la vigne. Anthracnose, pourridié, broussoins, etc.

Jour. Agr. Prat. (1890), T. II, p. 384.

255 MARGUERITE-DELARCHOLONNY, P.—(Destruction des mauvaises herbes par le sulfate de fer).

Jour. Soc. Agr. Brabant et Hainaut (1897), No. 49. E. S. R. 9, p. 846.

256 MARGUERITE-DELARCHARLONNY, P.—La chlorose et le sulfate de fer. Son Emploi aux racines.

Jour. Agr. Prat., T. I, (1889), p. 894.

Quotes M. Chauserroye as to improving the quality of grapes.

257 MARGUERITE-DELARCHARLONNY, P.—Destruction des Mouses dans les Prairies.

Jour. Agri. (Paris), Sept., (1887).

258 MARGUERITE-DELARCHARLONNY, P.—Les effets du sulfate de fer comme engrais dans les vignes en 1888-1889.

Jour. Agr. Prat., 119, (1889), T. I. p. 743.

259 MARGUERITE-DELARCHARLONNY, P.—LaChlorosé et le sulphate de fer. Causes de la Chlorose.

Jour. Agr. Prat., 119, (1889), T. I. p. 743.

260 MARIE, E.—Destruction des sanves par le sulfate de fer.

Jour. Agr. Prat., (1899), T. I, p. 344.

A review of German work.

261 MARRE, E.—Essais de destruction de la sanve ou moutarde sauvage et de la Ravenelle.

Semaine Agr. (Paris), (1901), p. 358.

E. S. R. 13, 658.

262 MARTIN, P.—Destruction des Sanves.

Jour. Agr. Prat., (1897), T. I, p. 861.

A 10% solution of S. of I. applied at the rate of 12-15 Hkt. per Hectare used to destroy wild mustard in wheat fields. Corroborated the observations of Bonnet, Brandin and Bernard. Prefers S. of I. to Sulphate of Copper. Wheat, clover and Black Medic suffered slightly from the treatment, but recovered in a few days.

263 MASSEE, G.—A Text Book of Plant Diseases Caused by Cryptogamic Parasites.

Used a mixture of,

Water .....50 gals.
Sulphuric Acid ..... 1 pt.
Sulphate of Iron.....25 lbs.

"This preparation may be used with great advantage in those cases where a disease has previously existed, as it destroys resting spores that may be concealed in crevices of bark, brickwork, or on the ground under fruit trees. In spraying fruit trees, vines, etc., the trunk and branches should be thoroughly drenched; but it is all important to remember that the spraying should be done during the winter, or at all events, some time before the leaf buds begin to swell, otherwise the foliage would be completely destroyed. This preparation should not under any circumstances be applied to leaves or fruit." pp. 37-38.

264 MAYER, A.—Einfluss von Eisenvitriol in Boden auf den Ertrag der verschiedenen Getreidearten.

Jour. Landw., XL, (1892), S. 19-22.

Centbl. Agr. Chem., Bd. 22, (1895), S. 158.

265 MAYNARD, S. T.—Experiments with Fungicides and Insecticides with Orchard Fruits and Grapes.

Hatch. Exp. St. Bull. 17 (1892), p. 37.
E. S. R. 3, 864.

266 McALPINE, D.—On the Australian Fairy-Ring Puff Ball.

Proc. Linn. Soc. N. S. Wales, (1900), pp. 702-7.
Lycoperdon furfuraceum Schaff. A 5% solution of S. of I. used when the soil was dry, killed the mycelium.

267 McALPINE, D.—Report on Peach and Plum Tree Rust.

Dept. Agr. Victoria, Bul., (Melbourne), (1891), p. 138.
For the treatment of Puccinia pruni suggests as a remedy 1 lb. S. of I. to 8 gals. water.

268 McALPINE, D.—Report on Rust in Wheat Experiments, 1892-93.

Dept. Agr. Victoria Bul. (1894-95).

Ztschr. Pflanzenkrank., (1896), S. 48.

S. of I. applied as a top dressing to the infected field. Results doubtful.

269 McCARTHY, G.—Plant Diseases and How to Combat Them.

No. Car. Agr. Ex. Sta. Bul. No. 76 (1891), pp. 20.

S. of I. is of special value against Anthracnose of the grape and raspberry. A simple solution may be made of,

S. of I..... 5 lbs.
Water .....22 gals.

Or a solution may be made of,

S. of I..... 5 lbs.
Paris Green ..... 2 oz.
Water .....22 gals.

270 McCONNELL, P.—The Elements of Agricultural Geology: a Scientific Aid to Practical Farming, 1902.

Iron Pyrites: "It is directly poisonous to plants, and even the sulphate or green vitrol, which results from its oxidation, is also injurious if present in large quantity. Even as little as 0.5% of this sulphate in the soil renders it almost barren, and on land containing more than 1%, nothing whatever will grow."

271 MEEHAN, T.—Sulphate of Iron.

Meehans' Mo., Vol. I, (1891), p. 74.

Use of S. of I. as a fungicide.

272 MENUDIER, A.—Traitement du Dr. Rassiguier contre la chlorose des vignes.

Jour. Agr. Prat., (1896), T. II, p. 157.

Thinks Dr. Rassiguier's treatment a complete success. In the spring, before growth had started, vines washed with a solution of 35 kgo. S. of I., 70 kgo. water.

273 MILLARDET, ( ).—Notes sur les vignes américaines. De l'adaptation au climat au sol.

Jour. Agr. Prat., (1881), T. I, p. 531.

Studied the influence of silica and iron in the soils on Chlorosis of the vine.

274 MOHR, C.—The Cause of Chlorosis in green leaves.

Gartenwelt, 2, (1898), No. 48, S. 569.

E. S. R. 10, 764.

Recommends S. of I. and Lime.

275 MOHR, ( ).—(Sulphate of Iron as an Insecticide.)

Insektgifte, S. 41.

Schizoneura langigera: The larvæ was killed, but the eggs unharmed, by a solution of,

Sulphate of Iron	10 gr.
Fusel Oil	50 "
Made up to	1000 ccm.

276 MOKRZECKI, S. A.—Über eine neue Methode Bäume zu nahren und zu heilen.

Travaux de la Soc. Imper. des Naturalistes de St. Petersburg, No. 1, January, 1903.

277 MOKRZECKI, S. A.—Über die innere Therapie der Pflanzen.

Ztschr. Pflanzenkrank., Bd. 13, S. 257.

Treatment of the Apple, Pear, Sweet Cherry and Grape.

278 MÖLISCH, H.—Über einige Beziehungen zwischen anorganischen Stickstoffsalzen und der Pflanze.

Sitzungsber. d. kais. Wiener Akad. 1 Abth. (1887) S. 19.

279 MOLISCH, H.—Die Pflanze in ihren Beziehungen zum Eisen (1892).

Also Sitzungsb. d. Wiener. Akad. 1894, Bd. 103. Abth. I, S. 556.

280 MORRIS, O. M.—Destroying Insects and Fungus Diseases.

Oklahoma Agr. Exp. Sta. Bul. No. 64, p. 12.

For the treatment of Anthracnose of the grape, apply a wash made of the following:

Sulphate of Iron	70 lbs.
Sulphuric Acid	1 pt.
Water	16 gals.

Wash the vines in the springtime before growth starts.

281 MÜLLER, C.—Kritische Untersuchungen über den Nachweis maskirten Eisens in der Pflanze und den angeblichen Eisengehalt des Kaliumhydroxyds.

Ber. Deut. Bot. Gesell., (1893), Bd. 11, S. 252.
Thinks Molisch's views lame.

287 MÜLLER, H.—Über Krankheiten der Reben und deren Bekämpfung.

Der Weinbau 8 Jahrg., (1882), S. 176-177.
Centbl. Agr. Chem., Bd. 12, S. 630.
For Peronospora use wash of S. of I. one part, water two parts.

283 MUNRO, J. M. H.—Potassium Chloride as a Plant Poison. Essential Elements of Plants.

Chem. News, Vol. LIII, (1886), p. 2.
Ferrous superphosphate, in effect a mixture of calcium sulphate, monocalcic phosphate and ferrous sulphate (12%), far from poisoning the plants, proved to be a good manure, and gave one of the best crops. (Potatoes.)

284 NÄGELI, C.—Die Ernährung der niederen Pilze durch Mineralstoffe.

Sitzber. K. Bayer. Akd. Wiss. Math. Phys. Kl. Bd. X, (1880), S. 340.
Claims iron to be unnecessary element, but publishes nothing to substantiate claim.

285 NARBONNE, P.—La chlorose de la vigne préservation et traitement.

Notice of this brochure in Jour. Agr. Prat., (1888), T. II, p. 188.
Used 50 kgo. S. of I. to 100 l. water.

286 NESSLER, J.—Einfluss der Stärke verschiedener Lösungen auf dass Keimen der Samen und das Wachsen der jungen Pflanzen und über die Stärke der Lösung, welche bei gegebener Düngung, im feuchten Boden und bei Regen ensteht.

Wochenbl. landw. Ver. Grossherzogthum Baden (1877), No. 6, S. 41-43.
Centbl. Agr. Chem., Bd. II, (1877), S. 125.
Pot experiments with plants shielded from rain but not from sunlight showed injurious action of S. of I. when the soil contained 0.25 gr. to 1700 litres soil.
Plants in a darkened room in moist soil containing 2 gr. S. of I. to 1700 l. soil, were not injured; on the contrary, the growth was benefitted. It was observed that the more S. of I. the soil contained, the better the plant growth. Plants 2-5 ctm. high were killed by the application of a 1.5-2.0% solution of S. of I. A .05% solution of S. of I. was found harmful to germination.

287 NESSLER, J.—Einfluss des Eisenvitrols und der Karbolsäure, welche dem Dünger Zugesetz werden, auf das Keimen der Samen und Wachsen der Pflanzen.

Wochenbl. des landwirths. Vereins im Grossherzogthum Baden (1876), No. 6, S. 42, 44; No. 7, S. 50-52.

Centbl. Agr. Chem., Bd. XI, (1877), S. 188.

288 OEHMICHEN, ( ).—(Hederichvertilgung).

Ztschr. Landw. Kammer, Schlesien, (1898), S. 177.

289 OEHMICHEN, ( ).—Unkräutvertilgungsversuche mittels verschiedener Metallsalzlösungen.

Ztschr. d. Landw. Kammer, Schlesien, (1901), No. 25.

Recommends 2½% S. of I. with 20% Fertilizer Salt.

290 ONO, O.—The Influence of Chemical Agents on the Growth of Algae and Fungi.

Jour. Col. Sci. Imp. Univ. Tokyo 13, (1900), pp. 141-186.

Jour. Roy. Micros. Soc. (London), (1900), No. 6, p. 698.

E. S. R. 12, 1014.

Extremely diluted S. of I. solutions favored multiplication.

291 OSSWALD, W. T.—Über die Bildung freier Schwefelsäure and löslicher Eisenoxydul verbindungen in der Moor substanz.

Landw. Jahrb., (1877), Bd. VII, S. 391.

Free sulphuric acid as well as S. of I. present in the soils.

292 OTTO, R.—"Veltha," ein neuer Krankheitszerstörer für Pflanzen.

Gartenflora, (1899), S. 575-577.

Centbl. Agr. Chem., Bd. 30, S. 358.

293 PADDOCK, W.—Anthracnose of the Black Raspberry.

N. Y. State Bul., 124, p. 261.

E. S. R. 9, 762.

Slight advantage in favor of S. of I. over Bordeaux mixture and Copper Sulphate.

294 PAGEOT, G.—Expériences sur l'emploi du phosphate et du superphosphate dans les terres acides.

Jour. Agr. Prat., (1895), T. II, p. 335.

295 PAGEOT, G.—Nouvelles expériences sur l'emploi du phosphate et du superphosphate dans les terres acides.

Jour. Agr. Prat., (1896), T. II, p. 444.

Experimental plot treated with 50 Kg. phosphatic cinders (14/16 P2 05), 8 Kgo. chloride of potassium, 14 Kgo. Sulphate of Iron. Applied in the fall to get the advantage of winter snow and rain. The springtime was unfavorable to growth but the vegetation was vigorous. The yield from this plot did not equal the yield from other plots treated with other fertilizers.

296 PAGNOUL, A.—(Various Studies on Arable Soils of the Pas-de-Calais.)

Terres Arables du Pas-de-Calais, Arras. 1894, p. 128.

E. S. R. 6, 121.

Changes S. of I. undergoes in soil. The sulphuric acid was not retained; the iron replaced by lime and nitrogen.

297 PAMMEL, L. H.—Some Fungus Root Diseases. Proc. 11th Ann. Meet. Soc. for Prom. of Agri. Science, Indianapolis, 1890, pp. 91-94.

Records experiments with S. of I. used against cotton-root rot which proved wholly unsuccessful.

298 PAMMEL, L. H.—Experiments with Fungicides. (Corn Smut-Ustilago Maydes.)

Ia. Agr. Exp. St. (Ames), Bul. No. 16 (1892), pp. 315-329.
E. S. R., Vol. III (1892), pp. 787-788.

The effect of Sulphate of Iron on the root system was determined by treating experimental plots with different quantities of S. of I. in the form of a 6% solution.

Plot No. I received 250 cc. with a resulting germination of 70%.

Plot No. II received 500 cc. with a resulting germination of 31%.

Plot No. III received 1000 cc. with a resulting germination of 40%.

The plants made an excellent growth and looked healthy and vigorous. Most of plants had three leaves. The root system was well developed, only a few roots being injured.

299 PAMMEL, L. H. & F. C. STEWART.—Prevention of Corn Oats Smut.

Iowa Sta. Bul. No. 20, (1893), pp. 721-728.

To prevent Oat Smut (Puccinia coronata) the seed was soaked two hours in a 1.2% solution of S. of I. The percentage of germination was good.

A solution of S. of I. did not reduce the amount of Corn Smut (Ustilago Maydis).

300 PAMMEL, L. H.—The Effect of Fungicides on the Development of Corn.

Agr. Sci. (1892), p. 217-220.

Ztschr. Pflanzenkrank., Bd. 3, (1893), S. 52.

Sulphate of Iron not shown to be injurious.

301 PARIS, MARQUIS OF.—Emploi des Engrais Chimique dans la culture Agricole et Maraichère.

302 DE PASS, JAS. P.—Peach Growing in Florida.

Exp. State Bul. 4, (1889), p. 8.

"Lime and Copperas may be used with profit around peach trees. I have tried both, and think that good has resulted from their use. From 1-3 lbs. Copperas according to the age of tree."

303 PEARSON, A. N.—Rust on Wheat.

Dept. Agr. Victoria, (Melbourne), Bul., No. 14, (1891), pp. 12-15. S. of I. was the only substance that had any useful effect.

304 PEARSON, A. W.—Experiments in treatment of the diseases of Plants.

Gard. and Forest, Vol. IV, (1891), p. 52.

S. of I. ineffectual in treatment of grape diseases.

305 PERRET, M.—Un nouveau produit pour la destruction de la sanve.

Soc. Nat. d' Agr. de France, (1898), p. 382.

Mixture of S. of I. and Sulphate of Copper successfully used to combat wild mustard.

306 PETERMANN, M.—(Treatment of Potato Disease.)

Jour. Agr. Prat., T. 55, (1891), p. 499.

Used a mixture of:

S. of I.	50 kgo.
Lime	25 "
Water	25 Hkt.

307 PETERMANN, A.—Versuche über die Sterilisation der Fäkalien.

Centbl. Agr. Chem., Bd. 27, S. 297.

A 2% solution of S. of I. does not kill pathogenic organisms. Number colonies of bacteria per c.c.m. after 24 hrs.:

1%	1½%	2% solution.
40074	8555	2756 Colonies.

308 PETERMAN, A.—Experiences sur les moyens de combattre la maladie de la pomme de terre.

Bul. Sta. Agron. Gembloux (1891).

309 PETIT, P.—Influence du fer sur la vegetation de l'orge.

Compt. Rend. Acad. Sci., (Paris), T. 117, (1893), No. 26, pp. 1105-1107.

Bot. Centbl., Bd. 54, (1894), S. 146.

Oat plants absorbed ferrous salts and an intensive assimilation of nitrogen resulted. Ferric salts acted as an intense poison.

310 PETIT, E.—(Anthracnose.)

Soc. des agriculteurs de France, 6 Juillet, 1889.

Recommends the employment of a cold saturated solution S. of I. Has incontestably proved its place as a cryptogamic fungicide.

311 PEYROUX, ( ).—(.)

Soc. d'Agr. du cantal, (1849).

S. of I. can replace calcium sulphate to advantage.

312 PFAUNDLER, L.—Notiz über Chlorophyll.

Liebig's Ann. Chem., Bd. 115, S. 37-45.

313 PFEFFER, W.—Über Election organischer Nährstoffe.

Jahrb. Wis. Bot., (Pringsheim), Bd. 28, S. 230.

314 PHIPSON, T. L.—Sur l'hématine végétale.

Compt. Rend. Acad. Sci., (Paris), T. 112, (1891), p. 666.

The red coloring matter in the algae Palmella cruenta contains iron.

315 PICHARD, P.—Influences comparées du sulfate de fer et du sulfate de chaux sur la conservation de l'azote dans les terres nues et sur la nitrification.

Compt. Rend. Acad. Sci., (Paris), T. 112, (1891), p. 1455.

Jour. Agr. Prat. (1891), T. II, p. 50.

Ann. Chim. et Phys., T. 25, Ser. 6, p. 271.

Salts of iron in general injuriously affect ferments which destroy nitrogenous matter, but organic iron salts favor nitrification.

So long as S. of I. has no opportunity to oxidize it has same effect on nitrification that gypsum has, though in less degree.

316 PLATZ, K.—(Vertilgung von Unkraut.)

Fühling's Landw. Ztg., Bd. 51, (1904), S. 415.

317 PORCHER, E. P.—Diseases and Insects of the Citrus.

Fla. Sta. Hort. Soc. (1902-1903), p. 39.

"Frenching or French leaf can be overcome by proper fertilization, by ditching, or by the use of ¼ lb. of Sulphate of Iron or carbonate of iron around the trees, either finely ground or sprinkled around, or dissolved in water and applied about the tree."

318 QUANTIN, H.—Effets opposés que le sulfate de fer peut exercer sur la végétation.

Jour. Agr. (Paris), T. II (1887), p. 13.

319 RASSIGUIER, ( ).—(.)

Messager Agr., Mars. 10, (1892).

Results in the years 1890-91.

320 RASSIGUIER.—Traitement radical de la chlorose.

Prog. Agr. et Vit. T. 18, p. 204.

321 RASSIGUIER, ( ).—Du Badigeonnage au sulfate de fer et de ses resultats.

Prog. Agr. et Vit. T. 24, (1895), p. 431.

Successfully used against chlorosis and anthracnose.

322 RAULIN, T.—Études chimique sur la végétation.

Ann. Sci. Nat. Bot., 5 Ser. T. II, (1869), p. 224.

323 REICH, E.—Über Hederichsvertilgungs-Versuche.

Thätigkeitber. d. Versuchst. f. Pflanzenkultur in Dresden, (1902). Jahresber. Agr. Chem. Bd. 46, S. 247.

Centbl. Agr. Chem. Bd. 32, S. 679.

The weed is killed by the solution and by the powdered salt. For a hectare use 666 l. of 15% solution, 200-400 l. of 25% solution.

324 REISCH, E.—Über Hederich vertilgungs Versuche.

Fühling's Landw. Ztg. Bd. 41, (1903), S. 89.

Experimented with powdered S. of I. alone and mixtures of S. of I. with sugar, dextrine and ashes, and with following results:

Action of powdered S. of I.....Very good.
" " S. of I. plus sugar.....Good.
" " " " " " dextrine .....Medium.
" " " " " " ashes .....Very good.

The action of a 15% solution was good.

325 RHODIN, S.—(Trials with copperas for eradication of moss in old meadows and lawns.)

K. Landtbr. Akad. Handl. och Tidskr 30, (1891), S. 139.
E. S. R. 4, 963.
Results undecided.

326 RICHARDS, H. M.—Die Beeinflussung des Wachsthums einiger Pilze durch chemische Reize.

Jahrb. Wiss. Bot., (Pringsheim), Bd., 30, (1897), S. 674.

327 RIEHM, ( ).—Unkräutvertilgung durch Chemikalien.

Deut. Landw. Presse, (1901), No. 48, S. 430.

328 ROBIN, A. B.—Diseased Cherry Trees.

Gard. and Field (Adelaide), Vol. XVII, (1892), pp. 182-183.

For treatment of Monilia fructigena a solution of S. of I. in form of a spray is recommended.

329 ROMMETIN, ( ).—Installation pour le sulfatage des céréales.

Jour. Agr. Prat., (1899), T. I., p. 651.

330 ROUSSILLE, ( ).—(The Destruction of Wild Mustard.)

Bull. Soc. Nat. Agr. Fr. 64 (1904), No. 6, pp. 451-52.

S. of I. mixed with Plaster, 300 and 200 Kgo. respectively per hectare, gave unsatisfactory results when applied to lettuce.

331 SACHS, J.—Erfahrungen über die Behandling Chlorotischer Gartenpflanzen.

Aus Arbeiten des Bot. Inst. in Würzburg.

332 SACHS, J.—(.)

Experimentalphysiol., (1865), p. 144.

Arbeit. d. Bot. Institut. zu Würzburg, (1888), Bd. III, S. 433.

333 SACHS, J.—(Chlorosis.)

Natur. Rundschau. (1886), No. 29.

334 SACHS, J.—Über die Erziehung von Landpflanzen in Wasser.

Bot. Ztg. Bd. XVII, (1860), S. 113.

335 SACHSSE, R.—(Sulphate of Iron, a Plant Poison.)

Lehrbuch der Agriculturchemie, (1888), S. 505.

336 SAGNIER, H.—(La Chlorose.)

Jour. Agr., (Paris), (1891), T. II, p. 147.

337 SALM-HORSTMAR, ( ).—(.)

Versuch über d. Ernährung d. Pflanzen, (1856), S. 8, u. 17.

338 SANDERS, EDGAR.—The Carnation Rust.

Prairie Farmer, Vol. LXIV, (1892), p. 151.

The disease may be combatted with S. of I. ½-⅓ lb. to gallon of water.

339 SANDERS, ( ).—Encyclopaedia of Gardening.

340 SAUNDERS, WM.—(Experiments with Fertilizers on Plots of Crops.) Appendix to Rpt. Min. Agr. Canada Experimental Farms Reports.

Effect of Sulphate of Iron on Root Crops: 1893, 23; '94, 33; '95, 38; '96, 52; '97, 51; '98, 63.
Effect of Sulphate of Iron on Barley: 1893, 13; '94, 28; '95, 33; '96, 46; '97, 45; '98, 57; '99, 28; 1900, 40; '01, 47.
Effect of Sulphate of Iron on Potatoes: 1894, 34-35; '95, 40-41; '96, 53-54; '97, 52-53; '98, 64-65.
Effect of Sulphate of Iron on Oats: 1893, 15; '94, 29; '95, 34; '96, 47; '97, 46; '98, 58; '99, 29; 1900, 42; '01, 49.
Effect of Sulphate of Iron on Wheat: 1893, 11; '94, 27; '95, 32; '96, 45; '97, 44; '98, 56; '99, ; 1900, 38; '01, 45.

341 SAXER, H.—Einwirkung des Kupfer u. Eisensulfats auf Landwirthschaftliche Kulturpflanzen.

Inaug. Diss. Rostack 1903.
Illus. Landw. Ztg., (1903), S. 89.
Jahresber. Agr. Chem. Bd. 46, (1903), S. 246.

Pot and field experiments showed that spraying plants in healthy condition resulted in increased yield. In no case will injury result from spraying.

342 SCHADE, ( ).—Über Vertilgung des Hederichs durch Eisenvitriol.

Sächs. Landw. Ztschr., (1899), S. 25.
Jahresber. Agr. Chem., Bd. 42, S. 350.

A 15% solution S. of I. did not touch the weed; 20% solution did.

343 von SCHILLING, ( ).—Schneckenvertilgung.

Obst and Gartenbau, 1898, No. 23.
S. of I. was recommended in the Weiner illustr. Gartenz. 1897, S. 388.

Powdered S. of I. mixed with dry soil or sand and on damp days or after sunset spread evenly on the surface of the ground, kills snails and rain worms coming in contact with the salt.

344 SCHLEYER, ( ).—Beiträge zur Kalidungungsfrage.

Deut. Landw. Presse 29, (1902), No. 2, S. 12.
E. S. R. 13, 729.

Effect of S. of I. solutions on Charlock growing in soil deficient in lime and on that abundantly supplied with lime. In the first case spraying with 10-15% solution produced no result, while in the second case a spray of 10% solution quickly killed the plant.

345 SCHNORB, ( ).—Un remède radical contre l'anthracnose.

Vigne Amer., (1879).

The first proposal to use S. of I. for the treatment of anthracnose. Used in the form of a concentrated solution (50%).

Schnorb had five years success before he gave publicity to the method.

346 SCHÖYEN, W. M.—Beretning om skadeinseketer og Plantesygdomme i (1899.)

Ztschr. Pflanzenkrank., Bd. XI, S. 106.

Successful treatment by spreading powdered S. of I. at the rate of 3 kgo. per ar.

347 SCHRIBAUX, E.—Destruction des sanves.

Jour. Agr. Prat. (1899), T. II, p. 43.

348 SCHRIBAUX, E.—Un nouveau fléau a combattre invasion des luzernières par une nouvelle espèce de cuscute.

Jour. Agr. Prat. (1899), T. II, p. 272.

On account of the form of the plant the author recommends the abandonment of the Sulphate of Iron treatment and the use in its stead of several indirect means.

Studied the effect of Sulphate of Iron solutions on the germinative power of cuscuta seed and found that after soaking seed for fifty days in a 20% solution, 12% of the seed germinated against 19% when soaked without the metallic salt.

349 SCHULTZ-SOEST.—Zur Vertilgung des Ackersenfs und des Hederichs.

Fühling's Landw. Ztg., (1897), S. 625.

Recommends a 15% solution S. of I. applied at the rate of 600 l. per hectare.

350 SCHULTZ-SOEST.—Hederich-Vertilgung.

Ztschr. Landw. Kammer Schlesien, 14 Mai, (1898).

Ztschr. Pflanzenkrank. Bd. VIII, S. 184.

Spraying with S. of I. solutions killed weeds and did not injure Oats.

351 SCHULTZ-SOEST.—Zur Hederichvertilgung nach Prof. Weiss.

Deut. Landw. Presse, Bd. XXVI, S. 754.

352 SCHULTZ-SOEST.—Zur Vertilgung des Ackersenfs und des Hederich.

Fuhling's Landw. Ztg. (1898), S. 393.

A 15% solution of S. of I., applied at the rate of 400 l. per hectare, is as strong as necessary. Oats are in no way injured by the spray.

353 SCHULTZ, ( ).—Zur Vertilgung des Ackersenfs und des Hederichs.

Landw. Ztg. Westfalen u. Lippe, (1897), S. 329.

Jahresber. Agr. Chem. 40, S. 406.

A 30% solution of S. of I. using 1 cbm. per hectare, completely eradicated wild mustard in fields of Barley. Oats showed signs of poisoning and stood still in growth for fourteen days but recovered completely.

Enough rain fell after spraying to wash off S. of I.

15% solution S. of I. is strong enough for the work.

354 SCHULTZ, G.—Gegen den Hederich.

Wchnbl. Landw. Ver. Bayern, (1901), S. 399.

355 SCHULTZ, G.—Zur Hederich vertilgung nach Prof. Weiss.

Fühling's Landw. Ztg., (1899), S. 690.

356 SCHULTZ, G.—Zur Hederichvertilgung.

Landw. Ztg. Westfalen u. Lippe, (1901), S. 240.

Jahresber. Agr. Chem. Bd. 44, S. 239.

A 15% solution S. of I., applied at the rate of 125-150 l. per morgen successfully used. R. raphanistrum withstands. If does not destroy plants it prevents their blooming.

357 SCHULTZ, G.—Zur Hederichvertilgung nach Prof. Weiss.

Landw. Ztg. Westfalen u. Lippe (1899), S. 273.

Jahresber. Agr. Chem., Bd. 42 (1899), S. 351.

A weed killing mixture called "Hederichtot" containing 6.85% ferrous oxide. Consists practically of S. of I., gypsum and sand.

358 SCHULZ, A.—Uber den Stoffbedarf und den Stoffumsatz des Kahmpilzes.

Ann. der Oenologie, Bd. VII, S. 115-147.

Just's Bot. Jahresber, (1877), S. 84.

Classes iron as one of the unnecessary mineral components of plant.

359 SCHULZE, B.—Versuche über Vertilgung des Ackersenfs durch Besprengen mit Eisenvitriollösung.

Ber. Vers. Stat. Breslau (1898), S 14.

Jahresber. Agr. Chem., Bd. 42, (1889), S. 350.

360 SCRIBNER, F. L.—Dotted or Speckeled Anthracnose of the Vine.

Orchard and Garden, Vol. XII. (1890), p. 82.

Recommends a wash of 50% S. of I.

361 SCRIBNER, F. L.—Fungous Diseases of the Grape and other Plants. Chap. IX. Anthracnose.

362 SCRIBNER, F. L.—Treatment of Anthracnose of the Vine.

Orchard and Garden, Vol. XII. (1890).

Quotes from Le Prog. Agricole, Oct. 26, (1890), the composition of a wash.

S. of Iron	7 lbs.
Sulphate of Copper	2 lbs.
Sulphuric Acid	1 gill.
Water	3 gals.

363 SEMPOTOWSKY, A.—Beitrag zur Bekämpfung der Kartoffelkrankheit. (Phytophthora infestans.)

Ztschr Pflanzenkrank, (1894), pp. 323-25; (1895), pp. 203-4.

Used as a mixture of S. of I. and lime to treat the potato disease, but without success. Used 2, 6 and 8% solutions. S. of I. retarded the growth of vines and reduced the yield of tubers.

364 DE SEYNES, ( ).—Resultats de culture du Penicillium cupricum.

Bul. Soc. Bot. France, T. XLII, (1895), pp. 482-85.

365 SHERINGHAM, H. C.—Charlock Spraying.

1st Ann. Rpt. of Field Expts., Irish Agr. Organization Soc. (1899), p. 43.

In field of Barley when the charlock is very young the application of a 7½% solution entirely successful. The Barley was slightly bleached.

366 SHUTT, F. T.—Experiments on the Prevention of Hard Smut or Bunt by treatment with Solutions of Copper Sulphate (Blue Vitriol), Iron Sulphate (Green Vitriol) and "Agricultural Blue Stone."

Appendix to Rpt. Min. Agr. Canada.

Experimental Farms Reports, 1891, p. 183, 291.

S. of I. inefficient for purpose.

367 SHUTT, F. T.—Experiments on the Prevention of Smut in Wheat.

Appendix to Rpt. Min. Agr. Canada.

Experimental Farm Reports, 1892, p. 137.

S. of I., 1 lb. to 8 gals. water, not efficacious in destroying the smut spores. Did not injure the vitality of the seed.

368 SHUTT, F. T.—Spraying for Destruction of Wild Mustard.

Appendix to Rpt. Min. Agr. Canada.

Experimental Farms Reports, (1899), p. 194.

E. S. R. 12, p. 564.

A 5-10% solution of S. of I. used at the rate of 50 gals. per acre in spraying plants 15-20" high, just beginning to flower, had no lasting results.

A 5% solution of S. of I. killed part of plants 6-9" high. The spraying should not be delayed until the plants are higher.

369 SHUTT, F. T.—Report on the effect of solutions of Copper Sulphate (Blue Vitriol), Iron Sulphate (Green Vitriol) and Agricultural Bluestone on the Vitality of Seed Wheat.

Ann. Rpt. Expt. Farms (Ottawa), (1890-1), pp. 146-148.

Used one pound S. of I. to eight gallons water, soaking the seed thirty-six hours. The vitality of the seed so treated was 96.5% against 55.5% and 40% for Agricultural Bluestone and Copper sulphate respectively. S. of I. did not materially affect the vitality of the seed.

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371 SKAWINSKI, P.—Traitement de l'anthracnose par le sulfate de fer.

Jour. Agr. Prat. 46, T. I, p. 815.

Centbl. Agr. Chem. Bd. XII, S. 633.

Modified Schnorf's remedy for anthracnose. Observed that the presence of free sulphuric acid added efficiency to the wash. Proposes S. of I. 50 Kgo., sulphuric acid (53Bé) 1 litre, water 1 hectolitre. Washed grape vines once during the first days of February. The immediate effect of the wash is to blacken the wood; a second application made to parts untouched by the first application.

Practice is well established in France.

372 SMETHAN, A.—Influence of Oxide of Iron and Alumina in the Reversion of Superphosphate.

Jour. Soc. Chem. Indus., Vol. XIV, (1895), pp. 112-242.

Centbl. Agr. Chem. Bd. XXV, S. 433.
as follows:

A Superphosphate of Lime containing 25.97% soluble P_2O_5 3.21% insoluble P_2O_5 and 1.36% Fe_2O_3. Reversion proceeded

Short time .....1.86% reverted
After one year.....2.39% "
After 15 mos.....2.42% "

373 SOL, P.—Anthracnose ou charbon de la vigne.
Jour. Agr. Prat. (1883), T. I, pp. 84-85.

374 SOL, P.—Études pratique sur l'anthracnose.

375 SOLLY, E.—Experiments on the Inorganic Constituents of Plants.

Trans. Hort. Soc. of London (1848), 2nd ser., Vol. III, pp. 37, 38, 43, 44, 46, 48, 50, 51, 94, 95, 99.

376 SOMERVILLE, DR.—Eradication of Charlock in Corn Crops by Spraying.

Trans. Highland and Agr. Soc. Scot. 5th Ser., Vol. XIII, pp. 10-17.

377 SOMERVILLE, DR.—Destruction of Noxious Weeds.

Queensland Agr. Jour. 4, (1899), No. 2, p. 149.

E. S. R. 10, 1049.

Obtained best results with 7½% solution using 40 gals. per acre. Charlock killed, thistles blackened and injured, and cereals uninjured.

378 SPRENGEL, C.—(.)

Allg. Landw. Monatschriften, Bd. I Jahrg. (1840), S. 207.

Notes occurrence of S. of I. in moorsoil. Small quantity not harmful; on the contrary, on clover like plants, Rape, Flax, etc., S. of I. works as well as gypsum.

379 STAES, G.—(Chlorosis in Plants.)

Tijdschr. Plantenziekten, 4 (1898), No. 4, p. 97.

E. S. R. 10, 1058.

Recommends S. of I.

380 STEBBINS, C. W.—Pear Blight.

Fla. Disp., Farmer & Fruit Grower, new ser., Vol. IV, (1892), p. 163.

Says blight was cured by sprinkling tree with solution S. of I., one tablespoonful to a bucket of water. Some put on ground and hoed in. (Quoted from "National Stockman.")

381 STEGLICH, ( ).—Zur Vertilgung von Hederich und Ackersenf mit Eisenvitriol.

Württemb. Wchnbl. Landw. (1898), S. 383.

Jahresber. Agr. Chem., Bd. 41, S. 319.

A 20 per cent solution kills Charlock and Wild Mustard when only a few drops strike the plants. The plants turn black, dry, and die inside of a week.

Young cereals show poisonous effect but recover in 8-14 days. Young clover badly burned and apparently injured. Quotes Strebel who used a 15 per cent solution.

382 STEGLICH, B.—Untersuchungen und Beobachtungen über die Wirkung verschiedener Salzlösungen auf Kulturpflanzen und Unkräuter.

Zetschr. Pflanzenkrank. Bd. 11. (1901), S. 31.

E. S. R. 13, 253.

Used 20 percent solution S. of I. Beets somewhat injured, Potatoes seriously injured.

383 STEGLICH, ( ).—Eisenvitriollösung oder Vitriolpulver gegen Hederich?

Sachs. Landw. Ztschr. (1900), S. 217.

Jahresber. Agr. Chem. 43, S. 352.

Action of dry powders (weed killers) is doubtful. Young Clover injured and in part killed by S. of I. Old Clover withstands the treatment and outgrows slight injury in very short time.

384 STEGLICH, ( ).—Zur Unkrautvertilgung durch Aufspritzen von Salzlösungen.

Sächs. Landw. Ztschr. No. 13, (1902), S. 265.

Centbl. Agr. Chem., Bd. 32, S. 185.

385 STEGLICH, ( ).—Über Unkrautvertilgung durch Salzlösungen.

Sächs. Landw. Ztschr. (1901), S. 401.

Jahresber. Agr. Chem. 44, S. 239.

Centbl. Agr. Chem., Bd. 32, S. 185.

386 STEGLICH, ( ).—(Why Sulphate of Iron kills Mustard.)

Sächs. Landw. Ztschr. (1898), S. 217.

Explains the action of S. of I. on mustard by assuming that the sulphur in the potassium myronate (C 10 H 18 NS 12 o 10 K) combines with iron to form sulphide of iron, thus causing death. Stender points out that Rape (B. napus oleifers) which also contains mustard oil is not injured, on the contrary is rendered more vigorous.

387 STEGLICH, ( ).—Das Weiss'sche Hederichvertilgungsmittel.

Deut. Landw. Presse (1899), S. 711.

Jahresber. Agr. Chem., Bd. 42, S. 352.

388 STEMMERIK, ( ).—(.)

Landb. Coar., (1890), No. 4.

This imperfect reference is quoted by Mayer in Lehrbuch der Agrikulturchemie as giving a short bibliography of the use of Sulphate of Iron.

389 STENDER, ( ).—Hederich Vertilgung durch Künstliche Düngemittel.

Illus. Landw. Ztg. (1902), No. 33, S. 332.

Centbl. Agr. Chem., Bd. 32, S. 188.

The fear of reducing the yield by spraying has proven groundless.

Recommends mixture.—

Sulphate of Iron	10 parts
Sulphate of Ammonia	10 "
Water	100 "

390 STENDER, A.—Vertilgung gewisser Ackerunkräuter durch Metallsalze.

Mitt. Landw. Inst. Breslau, Bd. III, (1900), S. 73.

Jahresber. Agr. Chem. Bd. XLIII, S. 353.

Treated under six heads:

1. By what salts are Charlock and Mustard most injured?
2. What is best concentration for a spray?
3. What is best time for spraying?
4. Is it necessary to repeat spraying?
5. What useful plants are injured and to what extent?
6. What is the physiological reason for death?

Well developed Red Clover and Peas did not show injury. Beans were badly injured.

391 STOCKLASA, J.—Die Physiologische Funktion des Eisens im Organismus der Pflanze.

Compt. Rend. Acad. Sci., (Paris), T. 127, (1898) p. 282.

392 STOHMANN, ( ).—(Chlorosis.)

Agron Ztg. v. Hamm, (1864), S. 325.

Exact researches have established the action of iron in Chlorosis and shown that the greening begins in and spreads from the ribs.

393 STRAUCH, ( ).—(Hederichvertilgung.)

Ztschr. Landw. Kammer Schlesien, (1898), S. 881.

394 SUCCI, A.—Azione del ferro sulla vegetazione.

Rass. Con. An. II, (1888), pp. 243-249.

May be said that the use of S. of I. requires a special soil in order to produce good results, and even then an excess will be injurious.

395 SUTHERST, W. F.—The effect of Lime on the Insoluble Phosphates in Soils.

Chem. News, Vol. 85, (1902), p. 157.

396 SUZUKI, S.—Über die giftige Wirkung von kaliumferrocyanid auf Pflanzen.

Bul. Col. Agr. Tokyo Imp. Univ., Vol. 5, No. 2.

Centbl. Agr. Chem, Bd., 32, S. 354.

Following work of Knop. Looks as though potassium ferrocyanide is not a source of iron for chlorophyll plants.

397 SUZUKI, U.—Über das Vorkommen von organischen Eisenverbindungen in den Pflanzen.

Bul. Col. Agr., Tokyo Imp. Univ., Vol. IV, p. 267.
Chem. Ztg., (1901), Rpt. 276.

398 TANTOT, J.—La fièvre aphteuse et sulfate de fer.

Jour. Agr. Prat. T. I., p. 666.

400 THAËR.—Principes raisonnés d'agriculture, T. II., p. 434 (1809).

401 THAXTER, R.—On certain Fungous Disease of the Onion.

Conn. Agr. Ex. St. (1889), p. 147, (Annual).

Experiments with Onion "Smut" (Urocystis cepulae Frost).

Six four foot rows were treated with 4, 5, 6, 7, 8, 9 and 12 grams S. of I. respectively, applied directly in the row. The 12 grams did not hinder germination perceptibly, and appeared to decrease the number of smutted plants decidedly. In another place in the same Bulletin, the Author says Sulphate of Iron may be discarded.

402 THOMPSON, S.—Uber die Wirkung von Schwefelsauren Eisenoxydul auf die Pflanze.

Sitzber. Naturf. Gesell. Dorpat (1892), Dorpat (1893), S. 96-101. Jahresber. Agr. Chem. N. F. Bd. 36, S. 106.

Experiments made with Triticum vulgare, Zea Mais, Avena elatior and orientalis, Pisum sativum, Medicago sativa, Trifolium pratense.

The germination is injuriously affected and seed did not germinate in a 2 per cent solution. Oats most resistant.

Young plants are injured by S. of I. (by long action). The roots die in a 0.005 per cent solution.

Grown, strong plants die on the fourth day when in 1-2 per cent solution. Grew, but with signs of distress in 0.1-05 per cent solution.

Raygrass lived for eleven days in a 0.1 per cent solution.

403 THOMS, G.—Wie ist der hohe Gehalt an Eisen resp. Eisenoxyd in der Asche von Trapa natans zu erklaren?

Landw. Vers. Stat. Bd. 49, S. 165.

403a VON THUMEN, F.—Die Phoma-krankheit der Weinreben verursacht durch die parasitischen Pilze Phoma vitis und Phoma Cookei.

The author has used most successfully a ten per cent solution of S. of I. for the destruction of the two fungi Phoma vitis and Phoma Cookei.

404 TOEPFFER, J.—Die fahrbaren Spritzen und die Vertilgung des Hederichs durch Eisenvitriol.

Deut. Landw. Presse, Bd. 30, (1903), S. 291.

405 TOME, C.—Il solfato di ferro e la clorosi.

L'Italia agricola, Bd. XXIV, (1892), pp. 375-6.
Ztschr. Pflanzenkrank. (1894), S. 164.

By the repeated watering of the soil with 8-10 per cent solutions, succeeded in curing chlorosis of pear tree as well as garden plants. Recommends distributing powdered S. of I. on manure heap to kill the worms and bind the ammonia.

To prevent anthracnose, recommends the application of a 35 per cent solution as a wash.

406 TONKS, E.—Artificial Manure (1887), p. 14.

407 TORD, M.—Expériences sur la chlorose de la vigne.

Jour. Agricole (Paris), (1887), p. 900.
Successfully used a 10-12 per cent solutions S. of I. poured around the stock of affected vines.

408 TREBOUX, O.—Einige stoffliche Einflusse auf die Kohlensäureassimilation bei submersen Pflanzen.

Flora Bd. 92, S. 59-60-70.
Particularly to be remarked is the fact that the iron salts (Sulphate of Iron and chloride of iron), in not too weak concentration, are a help to assimilation.

409 TRIBOULET, ROMMANTIN & ST. QUENTIN.—(Destruction of Wild Mustard.)

Bul. Soc. Nat. Agr. France, 64 (1904), No. 6, pp. 461-66.
Used S. of I. and Sulphate of Copper in powdered form.

409a TROUESSART,( ).—Microbes, Ferments, and Moulds. English edition, p. 38.

Mme. Ponsort quoted as using a mixture of four parts Sulphate of Iron and twenty parts of lime as a wash for grape vines a fortnight before the shoots start.

410 UDALE, J.—Gardening for All, p. 20.

411 von UNWORTH, ( ).—Zur Vertilgung von Hederich durch Bespritzen mit Eisenvitrol (?)

Ztschr. Landw. Kammer Schlesien (1899), S. 880.

Deut. Landw. Presse 26, S. 639.

Does not recommend S. of I. for killing weeds.

412 VANDERVAEREN, J.—Destruction des Sanves.

Jour. Agr. Prat. n. Ser. 5, (1903), No. 23, p. 731.

E. S. R., 15, 266.

Application of 200 Kgo. dry powdered S. of I. per hectare. This method generally practiced in Belgium.

413 VANDEVELDE, A. J. J.—Über den Einfluss der Chemischen Reagentien und des Lichtes auf die Keimung der Samen.

Bot. Centbl., Bd. 69, (1897), S. 337-342.

S. of I. extraordinarily injurious to the germination of Pisum sativum.

Soaked seed for 24 hrs. in solutions of S. of I. and with the following result:

	0.5%	1.0%	3% Solution
Per Cent Germinated.....	54.00	12.67	6.00
Germination Energy	3.8	7.2	4.90

414 VAUCLUSE COMITÉ D'ÉTUDES ET DE VIGILANCE.

Le Phylloxera An. II (1878) p. 184.

Results with Sulphate of Iron were negative.

415 VIALA & FERROUILLAT.—Traitement des Maladies de la Vigne (1888), p. 84.

416 VESTERGAARD, A. B.—Udryddelse af Agersennep af Jernvitriol.

Ugeskr. Landm. 47, (1901), No. 47, p. 451.

E. S. R. 13, 756.

417 VILCOQ, M. A.—Les Engrais en Horticulture.

Bul. Soc. Agr. France, (1902), p. 612.

418 VILLE, A.—Solforazione dei frutti pomacei.

B. Ort. Firenze. An. XII, (1887), p. 12.

Just's Bot. Jahresber, (1888), S. 14.

Applied a 2 per cent solution of S. of I. to young Apple and Pear trees in month of June. The size of the fruit was increased and the time of ripening hastened.

419 VILMORIN, P. L. de.—The Manuring of Garden and Allotment Crops.

Jour. Roy. Agr. Soc. England, Vol. 63 (1902), p. 142.

420 VIRCHOW, K.—Das Kehdinger Moor und sein Landwirthschaftliche Meliorirung.

Landw. Jarhber., (1888), S. 999.

421 VIVIEN, A., & L. GESCHWIND.—Essais sur la destruction des Sanves.

Engrais (1899), pp. 880-904.

Used Mixtures of S. of I. and sodium nitrate with satisfactory results.

S. of I.	Nitrate of Soda	Rate per Hectare
10 Kgo.	1½ Kgo.	10 Hkt.
5 "	3 "	10 "
25 "	.....	10 "
20 "	.....	10 "

422 VOELCKER, J. A.—On some Causes of Unproductiveness in Soils.

Jour. Roy. Agr. Soc. England, 2nd Ser. Vol. I, (1865), p. 113.
Due to three causes.—
a—Excess humic acids.
b—Presence of small quantity of S. of I.
c—Presence of Iron pyrites.

"Even as small a proportion as 0.5 per cent of green vitriol renders a soil almost barren, and on land containing little more than 1 per cent nothing whatever can grow."

423 VOELCKER, J. A.—The Destruction of Charlock.

Jour. Roy. Agr. Soc. England.
3rd. Ser. Vol. 10, (1899), p. 767.

424 VUYST, P. de.—(Field Experiments in Belgium.)

Cultures Speciales Exper. de Borsbeke-lez-Alost. (1893), p. 40.
E. S. R. 5, 233.
Did not observe favorable results with S. of I. used on Peas.

425 WAGNER, PH.—Destruction des sanves.

Jour. Agr. Prat. T. I. (1898), p. 577.
Used 15 per cent solution of S. of I. at the rate of 600 l. per hectare. Did not observe injury to Clover, on contrary the plants took on a fresher appearance.

426 WAGNER, P.—Wassenkultur-Versuche mit Mais.

Landw. Vers. Sta., Bd. 13, (1870), S. 74.
On the substitution of manganese for iron in culture solutions. Confirms work of Birner and Lucanus.

427 WEHMER, ( ).—Beiträge zur Kenntniss ein heimischer Pilze. 1895, Hft. 2, S. 159.

428 WEED, C. M.—Preventing Downy-Mildew, or Brown Rot of Grapes.

Ohio Agr. Exp. Sta. Vol. III (1890), No. 10.
S. of I. treatment ineffectual.

429 WEINZIERL, THEO. RITTER VON.—Über die Bekämpfung des Ackerhederichs.

Pub. K. K. Samen-Kontroll Stat. Wien, No. 199, (1899), S. 13. Used a 15 per cent solution of S. of I. in form of a spray. The S. of I. began to work inside of twenty-four hours. Cereals only slightly affected, especially Barley, but recover quickly. Peas and Clover are badly injured.

430 WEISS, J. E.—Die Bekämpfung des Hederichs durch Düngesalze.

Wchnbl. Landw. Ver. Bayern, (1901), S. 460.
Some comparisons made with S. of I.

431 WEISS, J. E.—Eine neue Hederichvertilgungs-Methode.

Deut. Landw. Presse (1899), S. 540.
Jahresber. Agr. Chem., Bd. 42, S. 351.
Secret compound called "Heufeld."

432 WEISS, A. & WEISNER, J.—Vorläufige Notiz über die directe Nachweisung des Eisens in den Zellen der Pflanze.

Sitzungsber. der Kais. Wiener Akad., Bd. 40, (1860). S. 276-278.
The first experiments to prove microscopically the presence iron in the plant. Concluded that iron is contained in the form of oxides both in the membrane and content of the cells.

433 WEYDEMANN, M.—Nochmals zur Hederichvertilgung mit Eisenvitrol.

Deut. Landw. Presse, 1899, S. 703.

Jahresber. Agr. Chem. 42, S. 351.

434 WILLIS, ( ).—The Use of Sulphate of Ammonia in Agriculture.

Jour. Gas Lighting, Water Supply, etc. Vol. LV. (1890), p. 737.

For "clover sickness" a field of clover received a dressing of three hundredweight of potassium sulphate and one hundredweight of ammonium sulphate applied in the early part of April. A second plot received a dressing of two hundredweights of S. of I.; a third plot a dressing of one hundredweight.

On the middle of May the disease had entirely ceased on the first two pieces of land the clover growing vigorously. At the end of July no sign of the disease on the second field, while the third field showed the disease.

435 WINTER, ( ).—(Hederichvertilgung.)

Ztschr. Landw. Kammer Schlesien, (1898). S. 721.

436 WOODWARD, J.—Thoughts and Experiments on Vegetation.

Phil. Trans. Roy. Soc. London, Vol. 21, (1699), p. 382.

437 WOLFF, E. V.—Verwendung von Carbolsäure oder Eisenvitriolhaltenden abtritt Dünger.

Braunschweig. Landw. Ztg., (1884), S. 157.

Fecal matter treated with carbolic acid or S. of I. and mixed with sufficient soil may be used without danger.

438 WOLFF, E.—Aschenanalysen von landwirthschaftlichen Producten.

Berlin, (1871).

439 WORTMANN, J.—Mit Eisenvitriol gedüngte Reben.

Ber. K. Lehranst Wein, Obst u. Gartenbau Geisenheim, (1895-96), S. 85.

Centbl. Agr. Chem. Bd. 26, S. 429.

Vines 12-15 years old grown in greenhouse showed bad result and this from improper application.

440 WÜTHRICH, E.—Über die Einwirkung Metallsalzen und Säuren auf die Keimfähigkeit der Sporen einiger der verbreitetsten parasitischen Pilze unserer Kulturpflanzen.

Ztschr. Pflanzenkrank, (1892), S. 16-31; 81-94.

On Phythophthora, Peronospora, Puccinia, Ustilago, neither the complete work of mercuric chloride nor the low price of S. of I. can take the place of Copper Sulphate.

441 ZIMMERMAN, A.—Over de Enchytrae iden en haar Vorkommen in de Koffiewartels.

Korte Berichten Uit S'Lands Plantentuin.

Ztschr. Pflanzenkrank. Bd. IX, S. 169.

S. of I. successfully used to combat nematode in Coffee Plant.

442 ZWEIFLER, FR.—Versuche mit Schutzmitteln gegen Peronospora und schwarzen Brenner.

Die Weinlaube, (1901), No. 15, S. 176.

Centbl. Agr. Chem. Bd. 30, S. 819.

A 3 per cent solution S. of I. injured young branches. Old leaves not injured. Hairy leaves resist injury; smooth leaves are burned.

443 (ANON.)—Preventive for Plum Rot.

Amer. Gard., Vol. XIII (1892), p. 180.

Burn leaves in autumn; spray before buds open in spring with S. of I., and after flowers open, with sulphide of potassium.

444 (ANON.)—Rust in Wheat.

Gard. Chron. (London), 3rd Ser., Vol. X, p. 521.

Spraying with 1 oz. S. of I. to the gal. water retarded appearance of rust, destroyed the rust when it appeared and prevented its appearance for fourteen days afterward.

445 ANON, ( ).—Apple Scab.

Amer. Agr., Vol. LI, (1892), p. 139.

Uses a solution of 1 lb. S. of I. to 1 gal. water.

446 ANON, ( ).—Preventive for Plum Rot.

Amer. Gard. Vol. XIII, (1892), p. 180.

447 (ANON).—Rust in Wheat.

Gard. Chron., 3rd Ser., Vol. X, (1891), p. 521.

448 ( ).—(Sulphate of Iron kills Dodder.)

Cape Agricultural Journal, Vol. X, p. 619.

449 (M.)—Destruction of Tree Roots by Fungus.

Agr. Jour. Cape Colony (Cape Town), Vol. III, (1891), pp. 169. For the treatment of Agaricus melleus it is recommend to remove the earth from about the tree, apply the S. of I. and cover the salt with fresh soil.

450 (SPRECHSAAL.)—Die Wirkungen der üblichen Disinfectionsmittel.

Ztschr. Pflanzenkrank, Bd. VII, S. 46.

In the use of S. of I. there is danger of injuring Beets, Rape, Wheat, Clover. Spores are not easily killed even when large quantity of S. of I. is used.

451 H. H.—Destruction des sanves.

Jour. Agr. Prat. (1899), T. II, p. 98.

Gives as the best time for spraying the time when the first four or five leaves are out and well opened.

452 ( ).—(Eradication of Weeds by Spraying with Solutions of Metallic Salts.)

Bul. Agr. (Brussels.) 1899, pp. 345, et suivantes.
Plots of oats were treated with the following solutions:

A. 4 kgo. sulphate of copper to 90 l. water.
B. 3 kgo. sulphate of copper to 91.5 l. water.
C. 3 kgo. sulphate of iron to 20 l. water.
Using the first solution the results were completely satisfactory; using the two other solutions the results were not satisfactory.

In Limbourg a 4 per cent solution of S. of C. and a 12 per cent S. of I. were efficacious.

In the province of Namur experiments with oats led to the following conclusions, namely:

A. The most favorable time for the destruction of mustard with saline solutions corresponds with the appearance of the fifth or sixth leaves.

B. That sulphate of copper is more active than the S. of I. From the point of view of economy the S. of I. is to be recommended over the S. of C.

C. The result of all the experiments is that a 20 per cent solution of S. of I. gave the best results.