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*(Notes of observations of injurious insects
for 1881*

5th REPORT
OF
OBSERVATIONS OF ATTACK
OF
TURNIP FLY
IN 1881.

BY ELEANOR A. ORMEROD,

F.M.S., ETC.,

AUTHOR OF 'MANUAL OF INJURIOUS INSECTS,' 'REPORTS OF INJURIOUS INSECTS,' ETC.

LONDON:

W. SWAN SONNENSCHN & CO., PATERNOSTER ROW.

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[Reprinted from 'Report of Observations of Injurious Insects,' 1881.]

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REPORT

OF

OBSERVATIONS OF ATTACK OF TURNIP FLY IN 1881.

Turnip "Fly." *Phyllotreta nemorum*.

1—3, *P. nemorum*; 4, 5, eggs; 6—9, maggots; 10, 11, pupa; all nat. size and magnified.

The unusually severe attack of Turnip Fly in the season of 1881 to a large amount of the Swedes and Turnips both in England and Scotland, and the attention consequently directed to the subject, suggested that, if whilst the amount of injury was still fresh in the memory, those possessed of information would give details of the extent of the losses sustained, and of any means found practically of use either in preventing or remedying attack, such information would be of great service to us all in drawing observation generally to the importance of the losses caused by this farm pest, as well as in showing that means lying in the ordinary measures of good cultivation are of service in checking the evil.

With this view circulars requesting information were forwarded to agriculturists, and others interested in the subject, in various localities throughout the country, which have been replied to far more minutely and fully than I ventured to hope; and, whilst I express my thanks to all those who have so courteously and ably assisted me, I wish especially to acknowledge the valuable help kindly afforded me, through the aid of Mr. Dent-Dent, President of the Royal Agricultural Society; also by Mr. C. Whitehead, Chairman of the Seeds and Plant Diseases Committee; and by Mr. J. H. Arkwright, of Hampton Court, Herefordshire, on the Council of the same Society; and by Mr. F. N. Menzies, Secretary of the Highland and Agricultural Society of Scotland.

For convenience of reference this information has been divided and classed in the following pages under various heads, showing the amount of attack in the localities observed, accompanied in some cases by estimates of loss; also notes regarding methods of cultivation and state of tilth found best suited to prevent fly-attack and encourage a good plant-growth; seed; dressings; applications found of service when fly is present; and other points bearing on prevention of attack.

The pest under consideration is for the most part referred to in these pages as "Turnip Fly," not by its scientific name, because the various kinds that injure us, whether they have a stripe along the wing-cases, like *Phyllotreta nemorum* (see above figure), or like *P. undulata*; or are brassy, like *P. concinna*, sometimes known as the

PHYLLOTRETA CONCINNA.

1 and 2, Hop Flea, nat. size and magnified; 3, hind leg, magnified, showing tooth.

Hop Flea-beetle, or Tooth-legged Beetle; or may be of others of the many species of *Phyllotreta*, or *Haltica*, as it was formerly called; still these are all "Fly" or "Flea" beetles, and, as far as we know, have all the same method of life; injure us more or less in the same manner (*P. nemorum* and *undulata* to the greatest extent with regard to Turnips), and are kept down by the same means. They live during winter, whilst torpid, under sheltering clods and rubbish, and in spring the Turnip-flies come out to feed on anything they can find of the Turnip and Cabbage tribe, especially such weeds as charlock or jack-by-the-hedge, until the young Turnips are ready for them, when we know too well where their preference lies; and there are several broods, sometimes as many as five or six, during the season. These are carried on by the female beetle laying eggs beneath the Turnip leaves. Small whitish maggots (see figure) hatch from these, and make their way into the pulp of the leaf, where they feed, and from which, when full fed, they come out and bury themselves about two inches deep in the ground, where they turn to chrysalids (see figure). From these chrysalids or pupæ the Turnip "Fly" or Flea-beetles are developed, and come up from the ground about thirty days after the date of the laying of the eggs from which their lives started.

The observations contributed show that attacks occurred in 1881 at various points in England, in the counties extending from Northumberland and Cumberland along the coast by Kent to Devon and Somerset, including in this range some of the more inland counties, as Beds, Herts, Wilts; and also the Isle of Wight. In the South Midland and Western districts, it occurred at localities in Oxfordshire, Gloucestershire, Monmouthshire, Herefordshire, and Derbyshire. It is mentioned by a contributor as less prevalent in Staffordshire; it is noticed at one locality in Cheshire; and West Lancashire is said to be never troubled with it; and the very few observations from the Principality, both from South Wales, mention freedom and presence of attack respectively at two localities near Brecon, and little to complain of near Bridgend, Swansea.

In Scotland the "fly" was exceedingly destructive in the southern counties, and is noticed as infesting the counties of Kirkcudbright and Dumfries; and also present to a serious extent in the border counties to Berwick, and up the east coast to Fife; also present in Lanark, and as far north as Perth and Argyle, but absent in the Isle of Mull; and at the extreme north in Caithness, where observations were carefully made for many weeks (and specimens forwarded accompanying), the mischief was caused not by the "fly," but by a very small weevil, very like the Turnip-gall Weevil in appearance, which proved to be the *Ceutorhynchus contractus*. In answer to special inquiry as to amount of "fly" in Orkney, it is mentioned that the Turnip Fly is scarcely ever seen there.

In Ireland "fly" was injurious at two localities in Antrim, in the Glenarm district, and by the shores of Lough Neagh; but these are the only two returns of attack I have received from that country.

Taking some of the best returned localities in England, we find that in the most northerly district of Northumberland there were three sowings on most farms, and the loss on one, taken as an example of many, was estimated at £320, this being a little less than £3 2s. 4d. per acre respectively on Whites and Yellows, and rather more than £4 per acre on Swedes. At Silloth, Cumberland, the loss was estimated at little less than £5 per acre.

Many hundreds of acres are noted as having been twice sown, and ultimately failed, in Durham; and in Yorkshire, the observer at Northallerton notes that nearly every one in that neighbourhood sowed twice, and there, and (where observed) elsewhere in the county, there was only *half* a crop; and from near York it is mentioned that the sowings, some for the second time, up to the first week in June, were nearly all destroyed.

In the case of thirteen farms in the parish of Weybread, Suffolk, two escaped, and at one the loss was total. At eight of these farms

resowing was requisite, and there was from no crop to half a crop of Swedes; and at seven of these same farms the Turnips failed. Loss, where estimated, £3 and £5 per acre.

In Hants severe injury and three sowings are mentioned in various localities, with an estimate from one of loss of £2 10s. per acre. In the Isle of Wight the resown plant came so late as "practically to give no crop," and this was estimated to be the case on nine-tenths of the island. In Dorset, it is noted, "people sowed Swedes three times over, and had to give them up after all." In Somerset, at the locality noted, there were four successive sowings of Rape and Turnips.

In Herefordshire, the only county of which there is a fairly complete series of returns, we find that notes from localities in thirty-eight parishes, occupying an area of seven miles radius round Leominster, show that at twenty-four of these some proportion (less or more noted on the Herefordshire tables appended) had to be resown once; at twelve others some proportion twice, thrice, or more. With regard to six larger districts of the county lying round Leintwardine, Ross, Tarrington, Eardisley, Pencombe, and Brockhampton, in one district all the early Swedes were damaged, and nearly all had to be resown; in another it is estimated that three-quarters of the Turnip acreage of the neighbourhood was damaged by "fly," and about one-half resown, in many instances resown twice; in another the first sowing of Swedes was wholly damaged throughout the district, and a large area of the second sowing; and in another it is returned "all the Swede crop damaged and almost the whole of it resown, some of it twice." Regarding the two remaining districts, in that of Pennoxstone (Ross) the district suffered much, and many crops had to be resown second and third times; and in that of Brockhampton, by Bromyard, resowing took place twice in several cases, and in some three times.

From Derby it is reported that "most farmers had to sow twice, and not a few even a third time, so that the crop throughout the Midland Counties was late.

In Scotland the visitation was worst in the south; scarcely a Turnip field is stated to have escaped in the counties of Kirkcudbright and Dumfries, and resowings were requisite in many cases twice, in some a third time. In Berwickshire there was great destruction, and resowings requisite, sometimes up to three times; and from inquiry of seedsmen at Haddington, and adjacent counties, it appears one-half more seed was purchased than the usual supply.

The direct amount of money loss on unreturned outlay for seed and resowings in the districts known to have been attacked amounts to an enormous sum, and this can be fairly well estimated; but beyond this there is still a heavy loss to be considered on lesser value of the White Turnip than the Swede crop, and also on the deficiency of the

late-sown crops, as well as in some cases the total loss. Also the deficiency of crop affects other points of agricultural supply, as want of cattle-food, and consequent lesser supply of manure, depreciation of price of stock, &c.; so that it is almost impossible to say how far the loss extends.

A tolerably correct estimate may, however, be formed of loss on seed and resowing, by calculating from the returns sent in what is the number of acres that may be estimated as attacked, and the number of resowings requisite, together with the average price of seed and amount used per acre, and cost per acre of the cultivation for resowing.

Taking only the Turnip Fly attack in England in consideration for present calculations, it appears that in the localities from which returns were sent, in the following twenty-two counties, resowing almost invariably took place, to a greater or less extent, once, in many cases twice, and in some three times; in a few cases fly-attack is named without specified details as causing serious injury, and from the many points at which fly-attack is reported, it may fairly be presumed to have been generally present in these districts; but in the following estimates only half the below-mentioned acreage is considered.

Acreage under Turnips and Swedes, as returned upon the 4th of June, 1881, in the under-mentioned counties of England, from the Agricultural Returns of Great Britain:—

Counties.	No. of Acres.
Northumberland	46,927
Cumberland	32,412
Durham	22,657
Yorks.	196,764
Lincoln	142,300
Norfolk	134,352
Suffolk	58,145
Essex	26,598
Beds	11,912
Herts	22,732
Kent	27,254
Sussex	30,472
Hants	79,173
Wilts	58,157
Dorset	38,639
Somerset	30,754
Devon	75,042
Oxford	34,191
Glo'ster	39,371
Monmouth	7,561
Hereford	22,753
Derby	11,602
Total	<u>1,149,768</u>

If we take half the total of 1,149,768 acres, that is to say, 574,884 acres, as the area to be resown once in the counties under consideration (a calculation which is probably much below the real amount), we shall get a basis for an estimate.*

1st. Taking loss on *seed alone* for one resowing; if we take the price of seed at 9d. per pound, and three pounds per acre as the quantity needed, this loss would amount to £64,674 9s. 0d.

2nd. Taking loss on one resowing of the same amount of acreage, including outlay for scuffling, harrowing, rolling, drilling seed, and possibly some additional superphosphate, we cannot well put the cost per acre under 15s. (if ploughing instead of scuffling should be required, it would be some shillings more, say 5s.); but taking the outlay as 15s., this would amount to the sum of £431,163 on the 574,884 acres.

If, according to the estimate of some of our agriculturists much better able to estimate outlay per acre than myself, this should be put at £1 rather than 15s., the loss of course agrees in numbers of pounds with the acreage, £574,884 on 574,884 acres.

Looking now at the returns from Scotland, Turnip Fly was present in various localities, or was generally prevalent to a serious extent in the following eleven counties having acreage of Swedes and Turnips returned on June 4th, 1881, as follows:—

Counties.	No. of Acres.
Kirkcudbright	14,596
Dumfries	20,247
Selkirk	2,859
Roxburgh	26,015
Berwick	29,993
Haddington	15,447
Edinburgh	12,495
Lanark	8,552
Argyle	5,256
Perth	31,098
Fife	27,547
Total	<u>194,105</u>

Half of this total of 194,105 acres is 97,052, and, following the previous method of calculation, the loss on this would be for seed £10,918 7s.; for one resowing at 15s. per acre, £72,789; for one resowing at 20s. per acre, £97,052.

* It may save trouble in reference to add that the total area and acreage under Swedes and Turnips in each division of Great Britain, as returned upon the 4th of June, 1881, and given in the Government Agricultural Returns, amount as follows:—In England to 1,478,682 acres; in Wales to 66,356 acres; in Scotland to 490,604 acres; in Ireland to 295,235 acres.

The loss therefore on the amount of acreage named in the twenty-two English and eleven Scottish counties would at the above estimate stand thus:—For seed alone, £75,592 16s. : for one resowing, including seed and cultivation at the rate of 15s. per acre, £503,952; the same at the rate of 20s. per acre, £671,936.

This amounts to just a little more, or considerably more, than half a million, and with the consideration of the great additional losses involved, though from their various nature it is impossible to calculate them accurately without special returns, it gives some idea of the amount of unproductive outlay, which, joined to consequent losses in its train, has made the visitation of Turnip Fly of 1881 nothing less than a national calamity.

In the following pages I give the information with which I have been favoured, as far as possible in the contributors' own words; and it will be observed that I have *not* included in the above estimates several of the counties in which I have only notes of attack isolated from the general area, though conjecturally, with the benefit of more returns, these would have been added to the list.

ENGLAND.

NORTH AND EAST COAST.

Observations regarding amount of presence of Turnip Fly at various localities in England, accompanied in some cases by estimates of loss and details of expenses of cultivation.

NORTHUMBERLAND.—Northern district, taking a radius of eight to twelve miles S.E., and N. of the village of Ford. In this district the large farmers maintain a permanent stock of sheep, and for winter supply of these and of the cattle a large acreage of Swedes and Turnips is required. In no year, probably, has the loss by Turnip Fly been greater than last season (1881).

On the great majority of Turnip-raising farms seed had to be thrice sown, and in one case a farmer sowed no less than twenty pounds per imperial acre before he could get a crop fit to single.

On every farm where sheep are kept, some acres of White Turnips are generally sown (these being matured early) as food for the sheep in the fall of the year; and in many cases these were entirely eaten off, and the Yellow Aberdeen Turnip had to be substituted. To give a single instance: on the farms of Fenwick Steads, Belford, which consists in some places of loamy and in some fields clayey soil, the first sowing was eaten clean off; Swedes were next tried, but these likewise were destroyed; and the whole acreage had to be resown with Yellows, which at last were a fair average crop. The Flea-beetle was noticed swarming by hundreds on the infested ground, but not a

single specimen of the *Ceutorhynchus contractus* (a small weevil destructive farther north, Ed.) was to be seen. Whilst the ravages were taking place the weather was very hot and sultry.

The following table of statistics, with regard to the Turnip-crop at Holborn Grange, Belford, Northumberland, shows the amount of loss on a good well-worked farm, and may be taken as an example of many in the same district (A. S. A.):—

Variety.	Acre- age.	No. of times sown.	Seed each time.	Time of 1st sowing.	Time of hoeing.	Rough estimate of pecuniary loss.
Swedes.	37	18 acres twice sown	3½ lbs. per impl. acre	23rd May	15th July	£150 0 0
Yellows.	34	13 acres twice sown	3 lbs. per impl. acre	13th June	End of July	£100 0 0
Whites.	26	Once	3 lbs.	29th June	End of July	£70 0 0
£320 0 0						

Morpeth. At Woodhorn Manor about twenty-five acres were lost by “fly” this year on good Turnip-ground which had been well manured and put in good order; also a ten-acre field of Swedes that were the first sown were badly injured by fly, but recovered enough to give half a crop.—(J. E.)

CUMBERLAND.—The district round Silloth suffered heavily this season from Turnip Flea (*Phyllotreta nemorum*), being once or twice resown. The loss on Turnip crop on many farms from this cause, with possibly some damage also from the caterpillar of the Turnip Moth (*Agrotis segetum*), was estimated at little less than £5 per acre.—(W. H.)

DURHAM. — Sunderland. During last June Turnip Fly was exceedingly injurious over the whole of this part of the county of Durham; many hundreds of acres were sown twice with Swedes and failed, when as a last resource the softer kinds were sown, which at the best are worth little more than half a good Swede crop.—(J. S.)

YORKSHIRE, N. Riding. — West Rounton, Northallerton. The general run of Turnip crop in this part of the county and beyond it, where observed, amounted on all strong soils to only half a crop,—the failure was in both Swedes and Turnip from drought and fly. Nearly every one sowed twice, but still fly-attack took place, and it did not answer. The early Turnips suffered most.

The money loss is estimated at £3 or £4 per acre. Value of a good fair crop of Swedes being set at £7, and of White Turnips at £5 per acre.—(C. H. W.)

Wilstrop Hall, York. In reply to your questions respecting the Turnip Fly in Yorkshire, this season the sowings (in some cases for the second time) up to the first week in June were all destroyed; even those put in amongst Mangolds early in April did not escape, the fly being so numerous and vigorous. Those drilled later suffered comparatively little, and the autumn fortunately proving mild they attained a fair growth; this is fully authenticated by farmers in various parts of Yorkshire.—(J. H.)

Goldsborough, near Knaresborough. I had forty acres damaged; twelve acres of Swedes were completely destroyed, and had to be resown; the second sowing was very much injured, and had I not sown four to five pounds of green Globe seed they would all have been destroyed a second time. I had not to sow any a third time; but the whole forty acres were stopped for one month and were not so good by £150 as they ought to have been, and I have no doubt would have been.—(L. P. O.)

Boro-Bridge. A very serviceable contribution of information, giving dates of sowing, dates and amount of attack, &c., is tabulated, and with additions of daily rainfall appended with the other tables.

LINCOLNSHIRE.—Limber, Ulceby. Whenever fly appears its attack is very general hereabouts. This year, on the strong land between Limber and the Humber, after sowing three and four times, the July drought was too great, and they got no crop. I can give no reliable estimate of the losses I have sustained from this pest; I may say, however, that the loss of my Turnip crop reduces the produce of that field fully one-half for the whole round of cropping, until the Turnip crop comes round again.—(T. H.)

NORFOLK.—Sparham, near Norwich. A note is given of forty acres of Turnips and six acres of Swedes being destroyed by fly; both resown.—(F. N.)

SUFFOLK.—Weybread. Information contributed by the farmers of this parish shows much harm to have been done by the fly. The details of numbers of resowings, &c., are given in tabulated form, for convenience of comparison, accompanied by a summary of the information, together with the other tables regarding Turnip Fly.

ESSEX.—Forest Gate. Soil light and sandy. Turnip Fly very destructive during the hot weather.—(W. J. F.)

Witham. On the 28th of July the Turnip Fly (*Phyllotreta nemorum*) was causing much injury to the Cabbage crops in the Labourers' Allotment Gardens, just outside Witham. In some places the crops were completely destroyed, not a vestige beyond the stem being left: and in other places they were fast going, and the beetles ("fly") were observed to feed in companies of as many as five or six, as well as singly.—(W. D. C.)

BEDS.—Biggleswade. One piece of Swedes was quite destroyed by fly, and had to be resown with White Turnips, which also were very much injured by them, and remained only half a plant.—(J. L.)

HERTS.—St. Albans. The damage done by the Turnip Fly in some farms in this neighbourhood is almost incalculable. Some few seem to have escaped, but, generally speaking, after repeated sowings the Swedes have been ploughed up and the ground sown with Rape or White Turnips; or the few Swedes left have been patched with White or Yellow Turnips. On my own farm, out of sixty acres of Swedes, only twenty have withstood the attack of fly; the remaining forty acres have been resown with White Turnips, which will be small, and a poor substitute for a good crop of Swedes.—(F. S.)

Langleybury, near Watford. The Turnip Fly has been very destructive to the crops this year. In the case of one small piece of White Turnips put in for early feed, which comprised Green Globe and Early White Stone, the Green Globe were not attacked; but the White Stone, although sown the same day and adjoining the former, were all taken; these were sown a second time, and were a miserable crop.

The whole of the first sowing of Swede Turnips (the Champions) were destroyed by the Flea-beetle, although there was a good plant, the weather at the time being hot and dry, with harsh winds.

The loss per acre is estimated at—

Extra labour and seed	£1
---------------------------------	----

Loss of weight, through lateness in crop	£1
--	----

Total per acre.	£2 (A. S.)
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Deard's End, near Stevenage. The fly (*Phyllotreta undulata*) has done greater damage to Turnips than I ever knew it to do before, owing greatly to the dry summer and the land not being moist enough to make the plants grow away from them. At least £80 damage was done to roots on my farm this season.—(B. B.)

SOUTH COAST.

KENT.—Kingsnorth. Mainly owing to the fly, the Turnip crops were a complete failure. On the observer's own ground the plants no sooner showed than the fly attacked them and cleared them off. A second sowing, part Swedes and part Turnips, were swept away, notwithstanding there was an excess of moisture, the land being too wet to work on; a third sowing was made as soon as practicable, but it was too late for Turnips; and the only substitutes, Cole and Mustard, did not have time to produce half a crop; the loss is estimated at not less than £50.

The fact that our Turnip crops were so nearly ruined had the effect

of lowering the price of store sheep and lambs from 5s. to 10s. each at the sheep-fairs and sales round here (Kingsnorth, Ashford, Kent). Many of the large buyers from Essex, Surrey, &c., did not put in an appearance at all, and those who did come only made limited purchases; and this owing to the failure of the root crops. The bearings of the question are so extensive that one hardly knows what interest is affected and what not.—(T. H. H.)*

SUSSEX.—Considerable damage was caused by Turnip Fly (*Phyllostreta undulata*) on farms situated to the north and east of Chichester, where the land is hilly and exposed; whilst those to the south, where the district is flat and low, enjoyed a comparative immunity. Acres of the first sowing of the plants were in many cases destroyed; with the second there was much better luck.—(J. A.)

HANTS.—Downton. The “fly” was by far our most troublesome pest in 1881. The soils on the Down slopes are very light and porous, and Turnips, Swedes, and Rape on both sides of the valley were taken once, twice, and even three times by the “fly”; as a result the root crops are backward and deficient.—(W. F.)

Strathfield Turgiss. The fly is reported to have been very prevalent in this locality, and in most cases three sowings were required. The total loss is estimated at about 50s. per acre.—(C. H. G.)

Thrupton. The Turnip Fly (*P. undulata*) was very troublesome here during May and the early part of June, in fact until we got some good soaking ground-rains. I lost all my Swedes after twice sowing, but had a good crop of late Turnips from the same land at the third sowing. I applied no artificial watering or other means to save the crop of Swedes.—(H. R.)

Alton. The Turnip Flea or Beetle has been more than usually hurtful this year; large districts in this county have been entirely stripped of every Swede and Turnip plant.—(D. T.)

Isle of Wight. At Birchwood about twenty-five acres of Swedes and White Turnips (sown broadcast), which came up well, were all lost by the fly; the same land was then resown with Purple White Tops, but from lateness and unfavourable weather the growth was small, so as practically to give no crop; and this case is estimated to represent eight- or nine-tenths of the entire island.—(H. P.)

WILTS.—Mere. In this locality nearly everything sown before the

* Most of the cottagers about here (Kingsnorth, Kent) are in the habit of sowing an ounce or two of some sort of Cabbage-seed in their garden, and selling the plants. The returns are often sufficient to pay the rent of the garden. This year, in nine cases out of ten the Flea-beetle swept the beds of every plant. I sowed about ten shillings' worth of Cabbage-seeds of different sorts for field and garden, and did not save a plant.—(T. H. H.)

first week in June was almost entirely destroyed; since then we have not been troubled at all. As to cost of resowing—this generally entails the expense of an extra ploughing, or at least a scarifying of the land. The former would cost about 10s. an acre; to this add two harrowings, 2s.; one rolling, 1s.; two hundredweight additional superphosphate, say 9s.; drilling, including either ashes or water, at least 2s. more; this would amount in the whole to 24s. per acre, without seed, which would be at least 1s. more—that is, supposing the land to be ploughed; if scarified it would be about 5s. less.—(T. H. B.)

DORSETSHIRE.—The Turnip crop suffered greatly from the *Haltica* in Dorset this year (1881); people sowed Swedes three times over, and had to give them up after all, and sow common Turnips. As a rule, the best fields of Swedes are but patchy. My own Swedes are fairly good, eighteen tons to the acre. I fortunately had not to sow a second time, but they were late, or (if the “flea” had not taken them) the crop would have been larger.—(J. B.)

SOMERSET.—Frome. This year at the end of February I sowed ten acres to Rape, and a few Tares; the Rape was all destroyed by fly. I broadshared the land and sowed Rape, which was eaten; then ploughed and sowed to Turnips and Rape, which was also destroyed; again cultivated the same field, which has proved satisfactory. The last two sowings were with the water-drill and best superphosphate. I also had to sow seven acres of Swedes three times with water and artificial manure.—(T. J. M.)

DEVON.—From Exeter it is mentioned on August 1st that the Turnip crops about Seaton and Beer were being devoured by Flea-beetles, in some fields scarcely a plant being left. The fields are difficult to manage, as they are covered with chalk-flints which nearly touch each other and shelter the beetles, but also prevent evaporation in dry weather; so that they are considered indispensable to the crops in dry summers in the light soil of the district.—(E. P.)

MIDLAND AND WEST DISTRICT.

OXFORD.—In the Thame district fly was very busy early in the season, and in many cases the crops had to be sown two or three times. The crop is estimated at about one-sixth of what might have been expected.—(T. B.)

GLOSTER.—From the neighbourhood of Lechlade. All early-sown Turnips, Swedes, and Rape were this year attacked by the Turnip Fly so much that every one who planted early had to replant.—(W. J. E.)

CIRENCESTER.—At the Royal Agricultural College the loss by Turnip Fly is estimated at about £30. Twelve acres of Swedes were resown once, and four acres twice. Another lot of fourteen acres of Turnips

was more than one-third deficient through the ravages of Turnip Fly.—(A. H.)

MONMOUTHSHIRE.—Immense damage and inconvenience has been suffered this season in the district round Newport from the Turnip Fly, but it is impossible to give a pecuniary estimate of the loss sustained. A crop replanted may be fairly calculated to cost £1 per acre for labour alone, and the later crop would probably be 25 per cent. lighter than the former had it stood; also the damage in the mutilation of crops, which are not quite bad enough to plough up, is of course enormous.—(R. S.)

HEREFORD.—Turnip Fly was very injurious in this county. Information as to amount of damage and means used for prevention, contributed from parishes in an area of seven miles radius round Leominster, and from six other districts in the county, are appended to this paper in tabulated form, with summary of information accompanying.—(Ed.)

DERBY.—Elvaston. The Turnip Fly was unusually troublesome during the summer of 1881. Most farmers had to sow twice, and not a few even a third time; consequently the crop throughout the Midland Counties was late, and, although the autumn has been particularly favourable, it is generally under an average.—(G. M.)

STAFFORD.—Standeford, Wolverhampton. We are not troubled very much if due care is taken in getting the land in good tilth, and a little artificial manure used. The Turnips are this year exceptionally good in this county.—(R. P.)

CHESHIRE.—Sandbach. On the whole the fly was only troublesome for a short time. The Whites sown before the third week in May were never attacked. Those between that time and the second week in June had to be resown as a whole, and after that there was little to complain of.—(G. W. L.)

LANCASHIRE.—Turnip Fly never distresses us much in West Lancashire. Swedes are generally grown, and, though the seed-leaves are more or less riddled by the flea-beetle, sufficient plants get away, favoured by the moist climate, to establish a good crop when thinned.—(W. W.)

WALES.

The following are the only notes I have received from the Principality:—

BRECON.—Nantyrhairn. This year my crop entirely escaped, and I cannot complain of any material loss for several years. I believe that well-cultivated farms, as a rule, are less subject to the ravages of the Turnip Fly. I have also found that early sowings are more subject to the attack of the fly, and I do not believe in sowing Swedes

before the 20th of May, or even the following week, should the weather permit.—(O. P.)

Penpont Farm, Brecon. The pest did considerable damage in this neighbourhood in the season of 1881 in several places; of fields sown precisely at the same time, some escaped with little or no damage, whilst others were completely spoilt. Of six acres under Turnips, I had four completely spoilt.—(T. J.)

SCOTLAND.

The following returns begin with the southern counties bordering on England, and proceed northward :—

DUMFRIES and KIRKCUDBRIGHT.—The evil caused by the Turnip Fly in the southern counties of Scotland this season is nothing short of a national calamity. Scarcely one field of Turnips escaped throughout the counties of Dumfries and Kirkcudbright, and in many cases seed had to be sown a third, and even a fourth, time. “We had, during three weeks in May, an unusually high temperature, with very clear sunny days. This gave the beetle a start, and the cold sunless weather of June and July never checked it. If the Turnips had been growing in June and July, as they do in an ordinary season, they would have grown out of harm’s way; as it was the beetles overpowered them, eating them off the face of the earth.” Taking an estimate (see acreage of counties of Dumfries and Kirkcudbright) believed to be very much below the real loss, it may be calculated that 30,000 acres in the two counties have this last spring required to be sown a second time owing to the ravages of the fly, and estimating four pounds to the acre as the average quantity sown, and 9*d.* per pound as the price, shows a loss in the single item of seed of £4500. The main result here (putting aside loss of money) is that there will scarcely be one-fourth of the usual quantity of Swede Turnips, for the resowings were mostly done with Whites and Yellows.—(R. S.)

SELKIRK.—From near Selkirk. This has been by far the worst year with the fly in my experience. Swedes, more or less, are attacked every year, but with thick sowing (about four pounds per acre) they generally survive; but this year they are almost a total failure in this district.—(J. G.)

ROXBURGH.—Branxholme, Hawick. We all suffered very severely this season, some having to sow Turnips three times over; but the weather has since been favourable, and on the whole we shall have a fair crop hereabouts.—(W. E. L.)

BERWICK.—Marchmont Dunse. In Berwickshire, where a large breadth of Turnips are grown for cattle and sheep, the destruction to the young plants by the Turnip Fly and frosty nights were such as to compel resowing in many instances three times. The early spring

months were unusually dry, the soil was friable, and required but little work to bring it to a fit state for receiving the seed, which in many cases was rather hurriedly put in to get clear of the work. No rain fell from the 21st of May to the 10th of June, and from the 28th of May to the 3rd of June the maximum thermometer read at 80°, 78° (three times), 74°, 71°, and 65°, where the following week the minimum thermometer fell on five mornings below the freezing-point, and on the 10th of June to 23° (that is, nine degrees of frost). Young Turnips were weak where they were not killed, and easily fell a prey to the vast numbers of fly—in fact whole fields were eaten up in a few days' time. The insects had it all their own way until the heavy rainfall of the 16th and 17th of June, and (though late) sowing still took place on several farms, in hope of obtaining at least part of a crop; nothing seemed to stop the ravages of the fly; but the rain, ten tons and fourteen tons per acre, had no perceptible effect, and not till we had a fall equal to fifty-eight tons on the 16th and forty-eight tons on the 17th, did the last of them disappear.*—(P. L.)

Earlston. The Turnip Fly (*Phyllotreta undulata*) has done much injury. It began to get numerous in the first week in June, and continued until nearly the end of July. Whole fields were destroyed, and had to be resown, in a few cases three or four times; and it is observed that it is not so much in the expense of resowing that the loss is felt, as in the plants being so backward that they never get to any size.—(R. R.)

Haddington. In the matter of the Turnip Fly our farmers have lost very largely this year. I know many cases where second and third sowings have been resorted to, and yet the crop is far below the average; and, as a result of the ravages of the fly, Swedes are very scarce with us this season,—not that the fly prefers them to White or Yellow Turnips, but by being first sown they are first ready for attack, and when eaten over it is, generally speaking, too late to sow the same kind again with the prospect of a full crop, and Whites or Yellows have to be substituted for them.—(W. D.)

Eaglescairn. On application to the seedsmen of Haddington as to extra amount of Turnip seed sold for sowing during the past season, it is replied they have sold one-half more than the usual quantity; and from similar inquiries made in surrounding counties it appears they also have sold one-half more than usual. Taking the acreage under Swedes and Turnips in 1881 in Haddington in round numbers as 14,000 imperial acres (number of acres was rather more, 15,447, Ed.), and estimating half of these to have needed resowing, the rough estimate of loss to this county by fly in this season of 1881 would amount to £15,660 sterling.

* The rainfall of the 16th and 17th represent respectively rather more and rather less than a fall of half an inch on an acre of ground. A fall of one inch amounts to 101 tons per acre.—(Ed.).

7000 imperial acres at 4s. per acre for double seed	£1,400
" " 40s. " for difference	
in value of produce of first and second sowing	£14,000
Horses' work, resowing	£260
	<hr/>
	£15,660

In many cases Turnips had to be resown three times, and the above calculation is considered below the loss.—(F. M.)

EDINBURGH.—Dalkeith. The hot weather at seed time brought on a rather severe attack of Turnip Fly, and many fields had to be sown twice over, and some three times. Where the first sowing escaped the fly the crop grew fast and turned out well; but cold and wet weather prevented the young plants making rapid growth after they were cut off the first time, so that the Turnip crop generally made little progress till the autumn,—(M. D.)

FIFE.—Out of fifty-two acres this season I had to sow forty-four over again, and some even a third time. I estimate my loss at £4 per acre.—(D. H.)

LANARK.—Farmers at Johnstone, near Glasgow, were greatly troubled by this pest, some of them having to sow as often as three times.—J. M'K.

ARGYLE.—In the neighbourhood of Ardkinglas, near Inverary, the fly has done an infinite amount of damage, not a field (save one in a damp locality lying along the banks of the River Fyne) or garden for miles round having escaped its ravages.—(T. W.)

ISLE OF MULL.—Torloisk. Not a single instance of fly-attack on Turnips was seen or heard of in the fields during the season, the large amount of rainfall in June and July amounting, in June to 5 in., and in July to 8·80 in., having forced the plants into the rough leaf very fast. A few early-sown Turnips in the garden were badly attacked by fly (*Phyllotreta undulata*), but a few dustings with soot saved the crop, and the latter sowings were not touched.—(C. G.)

PERTH.—Abercairny. This district suffered like most others, equally badly, and no remedy, to my knowledge, was tried by farmers farther than to depend on a return of moist weather and resowing. I have no doubt, owing to a continuance of frosty nights during the time the plants were in their critical stage, that in a good many districts they suffered much from the frost, and fell an easier victim to the fly. After twice sowing, and, in some cases, three times, we are likely to have a fair crop of Turnips, but below the average.—(J. B.)

Colenden, Stormontfield. Some farmers have had to sow a second and even a third time before a good braird could be well established.—(R. C.)

CAITHNESS.—Watten. All the damage we in the North have

sustained, so far as I can learn, has been from weevil. I am afraid not a few are putting down to *Haltica* that which has been done by *Ceutorhynchus contractus*.*—(G. B.)

The Turnip Fly is scarcely ever seen in Orkney.—(T. M'D.)

IRELAND.

The following notes are the only contributions received from Ireland relatively to amount of attack; the others refer chiefly to methods of cultivation:—

ANTRIM.—In the Glenarm district fly is reported to have never proved more disastrous to the Turnip-crop than in the season of 1881, as in some cases the seed had to be resown three times, and there was only an inferior produce after all. The average produce is estimated at one-sixth of what it should have been.—(T. B.)

Randalstown. In this neighbourhood, near the shore of Lough Neagh, we have usually an abundant supply of moisture, and good crops of Turnips when the land is well farmed. This year several farmers have had to resow owing to the havoc the fly made.—(J. M.)

The preceding pages convey some information as to the extent and amount of Turnip Fly-attack in England and Scotland; and in the following, under the headings of Cultivation, Seed, &c., the information is given with which I have been favoured regarding methods of treatment that have been found of service in prevention or remedy of attack. It may possibly be objected that there is too much repetition, but by thus reiterating the same advice or the same opinion from many different contributors we obtain a mass of evidence we could get no other way. One by one, from different soils, from different situations of hill or lowland, or circumstances of climate involving differences of temperature and of amount of moisture, we have the opinions—in many cases giving the long experience of some of our best agriculturists—that the ravages of this destructive pest *can* be much diminished by measures lying in the ordinary means of cultivation, and that it is to these we must look for all solid hope of prevention. Dressings of the seed may sometimes be of service; dressings on the plants, rolling, brushing, or other methods of treatment, when the fly-attack is present, may also be of service; in many cases, and especially in garden cultivation, they are shown to be so, but what we have to look to for safety in ordinary years, or help us to carry a fair amount at least of the plants through attack in bad

* See special account of injury by this insect (forwarded with specimens accompanying) under head of "Weevil" (*C. contractus*).

years, is sound agricultural practice, based on knowledge of the wants of the Turnip plant, and of the habits of the Turnip Fly.

The Turnip is very succulent, and needs plenty of food and moisture, and moderate warmth to press on growth; and the attacks of the Turnip Fly are most serious in heat and drought, for in such weather the "fly" or "flea" beetles propagate more freely, and use their wings, and consequently spread further; also heat and drought together keep back the growth of the plants, which are therefore exposed for a longer time to fly-ravage. Frost, or cold with drought, or cold with rain, or any kind of weather or circumstances that are unfavourable to plant-growth, also throw the crop under the power of this pest; but heat and drought are the worst, because they are good for the fly as well as bad for the plant.

In many of the following notes it will be observed that it is advised, by autumn cultivation (where this is practicable), or by working the land as early in the spring as it can be done, to preserve the moisture that has accumulated during the winter for the benefit of the germinating plants. By thus preparing the soil beforehand, little stirring of the ground is needed when the time comes for seed-sowing; and, instead of the land being repeatedly thrown open to (what is often at sowing-time) a drying sun and air until the surface moisture is completely dried out, the application of the use of cultivators or scarifiers, which expose little fresh soil, is enough. The surface of the ground, which has been mellowed by exposure to frost, or weather influences, gives a fine tilth suitable for germination, retains moisture evenly, and gives it out gradually and genially for plant-growth. The most favourable conditions are thus secured for the germinating crop, and there is the further advantage that where the land has thus been well cleaned and cultivated beforehand there will have been all the less food and shelter for the fly in winter and spring, and consequently less risk of attack.

What is the reason of the attack of 1881 we do not know with certainty; but looking at the way in which this pest infests Charlock, and spreads from it even in common seasons, and considering the quantity of this weed that followed on the wet season of 1879, together with the impossibility, after that wet, of giving the land the thorough cleaning needed to keep down the fly; such conditions point to the attack being fostered during 1880, and breaking out in unusual numbers when favoured by the unusual heat of the early summer of 1881, which was just suitable for its increase. The following notes refer mainly to this point:—

CHARLOCK.

Observations regarding prevalence of Charlock after wet seasons, and of large amount of attack of Turnip Fly in the year following a large Charlock crop, methods of eradicating Charlock, &c.:—

Bradford-Abbas, Dorset. As it turned out my farm was overrun with Charlock, the legacies of the last wet seasons; it came up in the Barley so thick that I expected the farm to look like a Colza-field; but, strange to say, the "fleas" attacked these gay plants of Charlock, and so completely destroyed it that there is now scarcely any Charlock on the farm. A more complete clearance of a pest than they made I never knew. Having done their work they went away, and my Swedes, sown late, escaped their visitation. These were fairly good, eighteen tons to the acre. I fortunately had not to sow a second time, but they were late, or the crop would have been larger if the flea had not taken them.—(J. B.)

There appears to be a clear connection between a prolific Charlock crop and a fatal fly-attack succeeding it the next year. 1880 was without doubt most remarkable for Charlock, so much so, in fact, that many cereal crops on these Hampshire Hills were entirely choked with it, so that many pieces of corn were not worth cutting. The soil on my farm (West Worldham, near Alton, Hants) lies upon the peculiar and rare "malm" or upper greensand, and, singularly, never suffers severely from Turnip Fly, possibly because this soil is not particularly favourable to Charlock. Another reason may be that it is capable of such trituration that our Turnip tilths are like beds of flour (almost as fine and white as common meal), and afford no cover to this insect, which revels amongst clods; a further cause may be the liberal use of lime.—(D. T.)

It is only fair to the Turnip Fly to say that it has this year done much good in some districts in devouring Charlock. This weed is one of the farmer's greatest enemies, and annually causes great damage to the spring Corn-crops; this year the golden carpeting has not been seen, and this, I believe, must be placed to the credit of the Turnip Fly.—(R. S.)

Before the Turnips came up the "fly" cleared whole fields of Charlock in this neighbourhood (St. Albans).—(F. S.)

From observations in past years there can be little doubt but that prevalence of Charlock and other weeds of the Cabbage kind in the white crops have a direct influence on the amount of presence of fly in the green crops following. It has often been noticed, when Charlock was abundant on any part of a field, that it was on this spot that fly-attack began, and also that hedges and other surroundings, where weeds of this and similar kinds are allowed to grow

neglected and unchecked, are spots from which the fly comes forth and spreads over the crop; anything, therefore, that would keep down or destroy these weeds would be a great preventive of fly-attack.

Charlock being very hard to get rid of, various plans have been tried with more or less success, such as growing Potatoes after lea, to be followed by Turnips, which allows the weeds to be kept thoroughly down for two years in succession; but the best means within the ordinary course of cropping is to harrow the stubble immediately after the Corn crop has been removed, to induce the germination of the seeds of all the weeds. The ploughing afterwards (which is postponed as long as possible) will then destroy the first crop. In spring the soil is again worked up, and left for a time, when a second growth is killed by passing a pair of harrows over the ground on a dry sunny day. An implement called a K has also been found serviceable. Here the Charlock is allowed to come into flower, when the implement, with its comb-like teeth, pulls off the flower, or pulls the plant up by the root, and leaves the grain-crop untouched.—(G. B.)

CULTIVATION.

Methods of cultivation found most suitable for pushing on healthy, rapid growth of the plant, and so carrying it from under power of the fly.

It is well known that want of moisture is the great promoting cause of injury by the fly. Next to this is a rough, badly-prepared soil in poor manurial condition.

Autumn cultivation should be aimed at as much as possible. Land intended for Turnips should not require any ploughing in spring, and as little scarifying as possible. A few hundredweights of good artificial manure, applied either before or when the seed is sown, promotes a strong and rapid growth of the braird until it gets into rough leaf, when danger from the "fly" is over.

After a long experience I never saw a failure of a braird of Turnips on land which had been long and well-prepared before the seed was sown. Good seed and plenty of it, three pounds per acre, drilled deeply from (say) two to three inches, ensures a good start, even in the driest times.

The application of soot, lime, nitrate of soda, or guano does much to save a crop (although much bitten by the fly) when a suitable rain follows, or when the land has been well moistened by a previous rain. Rapid growth is of course the great aim under any varying circumstances.—(R. V.)

A finely comminuted soil is of the greatest importance. On strong land autumn cultivation is essential; such soils, when ploughed immediately before sowing, invariably work cloddy. At this season

evaporation proceeds rapidly, and the moisture is soon dissipated; hence vegetation takes place slowly and unevenly, and the young plants are eaten off as they appear.

When the land is manured and receives a deep furrow during dry weather in autumn, the ameliorating effects of the winter's rain and frosts reduce the surface to a fine tilth, and a shallow scuffling, to destroy the growth of annual weeds before sowing, preserves the moisture, insuring a rapid growth of the young plants.

On the best Turnip land of the Midland Counties we prefer the ridge system of cultivation. The land, when reduced to a fine tilth, is ridged, the farmyard and artificial are applied, and at once covered in, and the seed immediately sown, whilst the soil is still fresh, on ridges twenty-seven inches apart. We never use less than three pounds of seed; we have always found thick seeding a great preventive against the inroads of the fly. Even when large quantities of farmyard manure are available, we prefer an addition of two to three hundredweight of artificial manures per acre, which rapidly pushes the plant through the time of its first leaves, or cotyledonous stage. In the chalks and drier climate of the south we prefer sowing on the flat; here we have found the water-drill of great use in giving the young plants a speedy start in trying seasons. Great injury is often done by rolling the land before the surface is quite dry, and thus forming a crust, through which the young plants have great difficulty in forcing their way. In short, a fine tilth, plenty of seed sown at once before the moisture has time to evaporate, the land lightly rolled, and the use of a fair quantity of phosphate manures are, in our experience, the best antidotes against the attacks of the Turnip Fly.—(G. M.)

The Turnip Fly seldom attacks Turnips and the like severely enough to destroy them when they are sown on a "stale" fallow (that is, on land ploughed in the autumn and laid as fallow during the winter and spring following), free from weeds and in a friable state, and are drilled in with superphosphate. Those suffer most that are drilled in after a previous green crop, such as Rye, Winter Oats, Vetches, &c. Early-sown crops generally suffer most. We seldom suffer (locality Mere, Wiltshire, Ed.) to any extent after midsummer. This year early Turnips, Rape, &c., were almost annihilated, but since the first week in June nothing has been seen of the fly; and on our Wiltshire hills we never suffer so much as in the valleys.—(T. B.)

As far as my experience goes, the fly does not go on stale mould as badly as on freshly turned-up soil, and is not very troublesome if the wintered or frosted mould is kept for the seed-bed. I have known the fly begin on one side of the field and spread rapidly over it, but I have never known them in anything like this quantity on stale

ground (or what may be called Nature's seed-bed). Where land has to be cleaned in the spring, and large breadths grown, small remedies are unavailing.—(C. C.)

I believe the surest way to prevent fly-attack is to have the land well and continually cultivated to bring it to the finest tilth, to keep it free from weeds as long as possible before sowing, and to use the water-drill with superphosphate, or other manure suitable to the land, having little rakes behind each drill-coulter to rake some dry loose mould over the water to keep in the moisture. Whenever I could adopt this plan I have rarely lost a plant by fly; but in farming such a condition of things as I have described cannot always be obtained.—(W. J. E.)

I am now more inclined to think that effort ought rather to be directed to prevention than cure by trying to secure the most rapid early growth of the young plant that can be possibly be attained, and I have found, from a number of experiments, that mineral superphosphate of lime, four hundredweights to the acre, gives the quickest braird as a rule.—(J. E.)

I am not aware that different kinds of manure either increase or diminish the liability to the fly, but undoubtedly soils that are peculiarly adapted for Turnip growing, which have been dressed with farmyard-dung in autumn, then ploughed, and, when sowing-time arrives, are found to be clean, so that the work of preparing for sowing does not expose or re-expose the soil to the drought (so that the drills are at once made with slight previous cultivation), a liberal supply of requisite manure, and the seed sown in a fine seed-bed, are the conditions most likely to force on the young seedlings to their rough leaf, and enable them to escape the fly.—(F. M.)

Eserick, York. Our light sand has such capillary power that we seldom lose the plants, although they were very much tried for a few days. Fineness of soil, and securing all the moisture that is possible by drilling up every day, seem the most necessary points in our case.—(J. C.)

I find the best plan for obviating the trouble from Turnip Fly is never to plough in spring; only cultivate, which keeps the moisture in the land, and the Turnips grow more vigorously.—(J. S.)

(From Limber, Lincolnshire, on the North Wolds, a stretch of chalk hills extending south from Barton-on-the-Humber, the soil at the locality varying from sand to good sandy loam overlying the chalk.) On the Wolds the difficulty the fly makes is this: we can grow splendid crops of Turnips if we do not miss "the season," but this is often of short duration, and, if the fly comes at the critical time, the chance of a good crop is very small. Wold-land is troublesome for weeds, and those who manage it in such a manner as to keep it clean

without having to knock it about too much in a *dry hot time*, have much less trouble with the fly than those who give extra ploughing, harrowing, &c., thinking to make a good use of the opportunity to get their land clean. When land is in good condition, well managed, and liberally manured, and the seed sown thickly, the plant will generally get into rough leaf in spite of the fly, and grow so quickly as to defy its attack.—(T. H.)

It is very desirable to work the land well, and get it fine and moderately close, keeping in the moisture as much as possible, at the same time stimulating the young plants with superphosphate or other Turnip manures.—(B. B.)

TILTH.—A fine tilth is most desirable; the parts of a field first hopelessly injured are those where the surface is the roughest, the small clods causing the moisture to dry out more quickly, and affording shelter for the fly from breezes which they do not like. All the preventives I have seen applied either to the seed or to the crop when attacked have been total failures.—(T. H.)

Good tilth and condition are the chief auxiliaries to push the plant out of the way of the fly.—(J. B. J.)

The finer tilth that can be got before sowing the better, and as to manure, I should recommend a liberal supply of whatever kind is used.—(W. H.)

I should add, as to the Turnip Fly, the finer the tilth the less are its ravages.—(C. H.)

I know of no remedy, but like to have my land in fine condition and well-manured, so that the plant may make the best use of its time in getting out of the way of the pest.—(R. S.)

As a rule ground is not sufficiently worked for root-crops, as, when hot dry weather sets in, the soil gets hard, and it is with difficulty the ground is brought into a good condition to receive the seed. I think the finer the tilth the better for all small seeds.—(A. S.)

I have always seen that the finer the ground is got before cultivation the quicker the plants come away, and the better and faster they grow out of the way of the fly.—(R. R.)

I think it is best to hoe as soon as the drills of seed can be seen, which will be much sooner if the tilth is fine, which I consider very necessary for all small seeds.—(T. J. M.)

SEED.

The importance of thick sowing strongly brought forward. Observations given of it having been found serviceable to sow seeds of various ages, so that some of the plants may be likely to escape the fly. Mixture of a small quantity of Mustard with the Turnip seed is mentioned as being of use on account of the preference of the fly for the Mustard plant, which thus attracts it from the Turnips. Observations on early sowing; also on sowing in weather suitable for germination, avoiding extremes of wet, or soil clogged thereby, as well as drought.

Unless the season is very favourable, I should prefer a *thick seeding*, as I have invariably found the rank-sown drills to do better than the thin, where the "flea" was numerous. As to the capabilities of the different varieties of Turnip and Swede to withstand the attack, I have found Turnips, as a rule, better than Swedes, and the somewhat coarse but hardy and vigorous variety of Swede raised in the north to stand the attack better than the varieties of finer quality.—(W. H.)

My only practical remedy was *thick sowing*.—(R. S. S.)

I have generally found *thick sowing* to stand better than thin, but this year the flea-beetles appear to be in much greater numbers, and stronger insects than usual, so that nothing will stand out against them.—(D. H.)

Very thick sowing is a great advantage, so that there may be plenty of plants to allow of many being eaten. We sow here (Eaglescarmie-Mains, Haddington), five pounds per imperial acre; but I observed this year, where the lad had left the stopper out of the seed-barrel, and had sown a few yards extraordinarily thick, the fly was not able to eat them all, and consequently plants were obtained for a crop.—(F. M.)

I think the best preventive of the Turnip Fly is to sow *plenty of seed*, because the thicker the seed the quicker it germinates; after the plant gets to a certain size the fly cannot hurt it; also to have the land worked as fine as possible.—(J. W.)

I fear the only remedy will be to feed our enemies by *thick sowing*. On this farm (Fans, Earlston, N.B.) sowing was commenced on one field on the 12th of May, and finished on the 14th, and, by way of trial, eight drills were sown at the rate of nine pounds per acre of Swede seed, and the rest of the field was sown with five pounds per acre of the same seed. The eight drills were thinned on the 20th of June, but part of the field sown with five pounds per acre was not ready until the 4th of July, and the rest of this part had to be resown. On the 2nd of November the crop on the drills sown at the rate of nine pounds was estimated as worth £4 or £5 per acre more than the part

sown with five pounds, and all sown at the same time, and with the same treatment.—(R. R.)

On a farm in the neighbourhood of Sunderland, Durham, where fifty to sixty acres are grown annually and a good plant is rarely missed, *six pounds of seed* are used per acre (three pounds being the quantity commonly thought sufficient). Of course the plants require to be thinned when very small, or else they would soon get “spindly” and spoil.—(Communicated by J. S.)

MIXTURE OF VARIOUS AGES OF SEED.—It is a good plan to sow a *mixture* of one, two, and three years' old seed, as the fly is not likely to attack all the growths.—(F. S.)

I always recommend farmers to sow a *mixture of old and new seeds* in this way, the old seed, being longer in springing, a successive crop comes up if the first is eaten over. I have known many cases in which this has proved successful, especially if rain followed, which would make the ground unfit for working, and thus prevent second sowing for (say) a week or ten days.*—(W. D.)

MIXTURE OF MUSTARD WITH TURNIP SEED.—I believe fully in the old custom of sowing *Mustard* seed with the Turnip seed (either drilled in or broadcast) as a preventive. The Mustard appears a few days before the Turnip, and is pounced on ravenously by the fly in preference, and in most seasons sufficiently protects the Turnip plant. This year, however, Mustard and Turnip were grazed off and totally ruined by the fly in these parts.—(J. H. A.)

I always put plenty of seed, and put a little *Mustard* with it; the Mustard grows faster than the Swede, and, as the fly always goes on the higher plant, we therefore find it on the top of the Mustard by preference to the Swede crop.—(C. C.)

The use of *Mustard* is also alluded to in the following note from the ‘Journal of Horticulture’ for Sept. 22nd, 1881, to which my attention has been drawn by several contributors.—ED.):—

“I noticed, in a market-garden to-day, what was to me a novel remedy. . . . A central line of *Mustard*, with seedling Cabbages, Cauliflowers, and Broccoli on one side and various Turnips on the other, all without a leaf touched. I understand this is a perfect remedy.”—(N. J. M. C.)

* With regard to the importance of sowing *good* and *reliable* seed, a correspondent draws attention to a difficulty which is very likely to arise in outlying districts where seed supplies run short, or where the necessity of using good seed to secure rapid germination is not enough considered; this is, that in years when farmers have again and again to resow their Turnip seed, inferior or old seed is liable to be offered at reduced rates, which many purchase and sow. This is a subject on which good agriculturists would need no hints, but in some cases the deficient quality of seed would explain non-appearance of the plant.—ED.

ON SOWING EARLY IN NORTHERN DISTRICTS; AND IN MOIST WEATHER,

(From upland-ground, Ayrshire.) I consider that the proper method of prevention consists in bringing the young plants quickly on to development of the rough leaves, and, as a measure to this, that there is nothing like early sowing. I have never seen the early sowing fail to produce a crop on such amount of land as I have annually to do with on an upland farm in Ayrshire, where we have been in the habit for many years of sowing our Swedes and Turnips of all kinds in the latter end of April or beginning of May, and (in consequence) we have never been troubled with the "flea," although—this year, for instance—our neighbours all round about who sow later on have had to resow two or three times. I estimate the crop at above thirty tons per acre. This early sowing gives the plant time to develop its rough leaves before the beetles appear in sufficient numbers to do harm, and the Turnips yield all the better crop from the longer time they occupy the ground. I am aware, of course, that early sowing would not suit southern districts, where again early-sown Turnips tend to run to seed, especially the softer varieties; but, if good seed is used, there is no danger on this score. We ourselves have never been troubled with an undue quantity of "shot" Turnips.—P. M'C.)

Ballinacourte, Tipperary. Sowing early, where practicable, and in such weather as would force the plant quickest into the rough leaf, that is immediately before or after rain, and the use at all times of plenty of seed, has been found successful.—(D. S. S.)

I am very particular never to let horses go on the land in spring when it is wet, and always like to let the land lay still for ten days before sowing; we run a skim through and drill when the land is quite dry *at the top*, using a good dressing of artificial manures and bones. I have noticed people drilling Turnips when the land was wet, and generally found that they suffered from the fly, unless the weather was showery for a week or so after. I have always thought the best preventive against the ravages of the fly is not to sow till you have a good season, nor before about the last week in May, and use a good dressing of phosphates, &c.—(E. R.)

I have never seen the fly so ravenous in either very early or very late sowings as in the medium, say from the middle to the end of May.—(L. P. O.)

STEEPS FOR SEED.

Opinions as to serviceableness or unserviceableness of damping or dressing seed before sowing, and notes regarding experiments with turpentine, paraffin oil; oil and petroleum (observations of the use of crystal oil, with sulphur dusted afterwards, on the seed,—and of carbolic powder with sulphur and soot drilled with the seed,—are given in the tables of returns from Herefordshire).

Some farmers damp the seed before sowing with turpentine, paraffin oil, or other strong-smelling fluid, or mix the seed with various powders; but none of these measures seem to have much effect in stopping the ravages of the little pest.—(W. H.)

I have tried dressing the seed with *turpentine*, but cannot say positively with any decided effect.—(F. S.)

Mottisfont, Romsey. Having heard at Romsey Market, and again at Andover Market, that, by the application of *spirits of turpentine* to Turnip and Swede seed, the parties using it had secured a good plant of those roots for several consecutive years, I tried the experiment myself on nine acres. On June 11th, 1881, twenty-seven pounds of what proved to be a mixture of Swede and Turnip seed was placed in two galvanised buckets, and four ounces of spirits of turpentine was poured into each, the seed being then turned thoroughly many times. Three days after (June 14th) the seeds were drilled at the rate of three pounds per acre, together with a mixture of screened chalk and sand at the rate of fifty bushels per acre. The seeds germinated well and quickly, and the plants certainly were free of the Turnip Flea for the first two or three days after coming up. After these first few days of freedom the flea appeared in very great numbers on the leaves, and attacked them heartily, but the Turnips and Swedes grew away from them. On June 27th flat-hoeing between the drills was begun in this piece, horse-hoeing on July 9th, and on July 11th we commenced singling out the plants. The result gives a very good piece of roots throughout the nine acres. Rightly or wrongly, I attach great importance to the fact of my having used spirits of turpentine, and I intend to continue the practice.—(G. A.)

Dressing the seed before sowing with pure *paraffin oil* has been found to have a good effect in preventing attack of fly and hastening growth of young seedlings.—(F. M.)

A second sowing of Swedes at Langleybury, Herts, steeped in *paraffin oil* was a good plant, but the flea-beetle took them in patches on the highest ground, which was a little foul at the breaking up.—(A. S.)

I have tried steeping the seed in *oil*, &c., and, although I found

some advantage, I also found that the difficulty of distribution was much increased by the altered condition of the seed.—(J. T.)

Have heard that it is a safeguard to use half a gill of petroleum to wet ten pounds of Turnip or Rape seed, but only tried with the last sowing; and as others that sowed at the same time and did not use it had a good plant as well as myself, I cannot say that it is a preventive.*—(T. J. M.)

IMPORTANCE OF A GOOD START TO THE PLANT, AND EFFECT OF MOISTURE, &c.

Reasons why fly-ravage is worst in drought. Observations of watering being of service, with difference of weight a fortnight after germination of watered and unwatered plants. Beneficial to sow in damp ground, and immediately on it being ready. Importance of stimulating the first growth by all means, including drilling manure with the seed, or use of liquid manure drill. Water-drill noted as (in a general way) starting the Turnips so that they are fit to single a week sooner than by the use of the dry-drill; but most serviceable in moist seasons, the small quantity of water applied being in dry seasons liable to start germination, which afterwards may perish from drought. Use in garden cultivation of watering with solutions of soft-soap, and very weak paraffined-water.

Anything that would *accelerate vegetation* would be the best means of saving the crop, but the reason the fly is so destructive on bright

* As far as experience shows at present, the prevention of fly-attack on the young plant, by previous use of steepes to the seed, is an uncertain matter, and, in cases where good results have occurred, we do not know clearly (if they were the direct result of the application) in what way the application worked. It is open to possibility that in the case of some of the steepes the application in dilute form may be absorbed into the tissues of the young plant to a sufficient degree to affect its taste to the insect that feeds on it. In the case of experiment made by myself (Trans. Ent. Soc. Lond., 1878, Part iv., p. 333), as to absorption of phenol preparations, it was found on analysis (by Messrs. Savory and Moore) that a minute quantity of a tarry volatile substance was present in the Carrot roots that had been watered with the dilute preparation; and if, by analysis of young Turnip plants from steeped seed, the presence of matter from the steep could either be proved or disproved satisfactorily, it would be a useful step. The point that seems more likely, however, is that the scent of the dressing so affects the land by coming up through the light surface-soil as to make it temporarily unpleasant to the fly. This would be quite reconcilable with the very different experiences on this subject, for the amount of smell would differ very much according to circumstances, such as dry heat, which would evaporate it strongly and rapidly round the germinating plant, or rain, which would drive the surface together, &c. If we could have notes with exact detail of the nature and the amount of steep used, nature of soil, condition of ground at time of sowing, and weather immediately following, we should see our way very much better.—Ed.

hot days is because half-a-dozen bites on the first smooth leaves of the Turnip plant wound them so much that the scorching rays of the sun shrivel the plant quickly and completely, whereas, if the days were cool and cloudy, the plant might survive long enough to enable it to throw out the rough leaves, which the fly will not attack so freely.—(T. H.)

In moist weather the flea is comparatively harmless; it is when dry parching weather sets in, just as the Turnips break ground, that the attack is most to be dreaded. In such cases I am of opinion that a frequent use of the *water-cart* is the best thing to do.—(W. H.)

In the garden, on a small scale, I have found *watering daily* to be a great preventive to the ravages of the flea-beetle, as also dry wood-ashes or road-dust thrown over the plant until it is strong enough to withstand the attack.—(A. S.)

With regard to precise effect of watering on the germinating plant, I can state, from such experiment as I have been able to make, that at the end of a fortnight from their appearance above ground, the plants from a patch of Turnips which had been watered (in a season of drought) on either two or three evenings, *weighed one quarter* or rather more than the plants from precisely the same measure of ground close by, and in exactly the same circumstances, excepting that they had not been watered.—(ED.)

I think that *surface moisture* is a good preventive, and that the seed ought to be sown *as soon after the ground is prepared* for its reception as can be, and the land not allowed to get dried.—(T. B.)

In the neighbourhood of Ardkinglas, Inverary, only one field is noted to have escaped ravage of Turnip Fly for miles round. This one field was a stubble, and in a damp locality lying along the banks of the River Fyne, with high-lying fields opposite. It was not ploughed till shortly before sowing, a fine and *moderately damp mould* was turned up, the seed was *immediately sown*, and a fine braird and crop followed. Several instances of resowing proved abortive, but wherever the drills were well harrowed down and set up by the common single-plough, fewer failures occurred.—(T. W.)

I observed two peculiar facts, *viz.*, that in a corner shaded by a wood the Turnips were not eaten off; again, that on the drills *surrounding a manure-heap* the same was the case.—(A. S. A.)

The great danger is when the Turnips are in the smooth leaf. By forcing them (naturally or artificially) quickly into the rough leaf, the attack may be warded off.—(W. R. S.)

The first requisite is to fight the enemy with a *good supply of manure*, so that the young plant may get out of his reach as soon as possible.—(J. T.)

A small quantity of *stimulating manure*, such as a half-hundredweight

of nitrate of soda per acre, sown along with the seed, combined with thick sowing, forces the plant on till past danger, and the stimulant, becoming soon exhausted, does not injure the crop afterwards. I believe that liquid manure drilled in would have the same effect.—(P. M'C.)

As to the effect of sowing in dry seasons with the *water-drill*, I have always found the water-drill most successful in moist seasons. When the land is very dry, the amount of water put in by a water-drill is not sufficient to be of any service to the Turnip plant, and sometimes it is sufficient to cause the seed to germinate, and then, if rain does not come, it dries up or malts in the land. I have always, in a general way, found the water-drill starts the Turnips much quicker than the dry-drill, and they generally are fit to single out a week earlier than if sown by dry-drill.—(T. H. B.)

In garden cultivation "I watered with a good strong solution of *black-soap* three afternoons in succession, and found that the pest was gone. Later on, when the main garden crop sown early in June was attacked, an application of very weak paraffined-water was made, and this cleared the fly."—(J. M'K.)

In garden cultivation it has succeeded to have the plot of Turnips infested by fly run over, by means of a watering-can, with *soft-soap* suds. The application was made about four times, and in the morning and evening.—T. B.)

DRESSINGS AS A REMEDY FOR FLY-ATTACKS.

Notes of such applications proving of little use; notes of beneficial application of lime; lime and soot, or lime and wood-ashes; gypsum, or gas-lime; also spent hops and salt. Attention is drawn to the importance of sprinkling the lime at night, or in the early morning, when the dew is on the leaf, so that the powder may adhere.

I have only tried (*and given up*) the ordinary mixtures, of which gas-lime and soot are usually the principal ingredients.—(J. E.)

Elvaston, Derbyshire. We have tried quick-lime, soot, and other artificial dressings with *no very beneficial results*.—(G. M.)

Bradford Estates, near Shifnal. On June 3rd the Turnip and Cabbage crops were fast going with the fly. Dusting with *quick-lime* and *wood-ashes* mixed was tried, and some of the Turnips (those that were beginning to come into rough leaf) were thus saved; the others that were just brairding were so severely attacked that they had to be resown.—(J. C.)

In the neighbourhood of Ormskirk, Lancashire, where the Turnip Fly made its appearance, sprinkling the leaves with *powdered lime* in

the early morning, whilst the dew was on, proved beneficial—in fact, checked the attack.—(W. R. S.)

“A note is given of the roots being saved again and again by sowing (out of a seedlip) *freshly-slaked dust of lime* upon the plants as soon as up. The most effectual method is to do this *at night* when there is sufficient *dew* to fix the fine dust.”—(Communicated by D. T.)

Lime is sown at dawn of day, so that it should adhere to the leaf whilst the *dew* is abroad; but if *spent Hops* can be readily procured, and the ground covered before the fly makes its appearance, it is a valuable aid, and protects the plant in its infancy.—(W. W. G.)

Where the plant is *watered*, and dusted with *cooled or partially-cooled lime* until the leaf is rough, the fly cannot hurt it much.—(J. S.)

In gardens the general remedy applied is dusting with soot and lime.—(J. B.)

GYPSUM AND GAS-LIME.—My Turnips were attacked by fly when they were about two inches above ground; we dressed them with *gypsum*, which stopped the ravages of the insect, and the Turnips made good progress afterwards. Should my Turnips be attacked at any future time, I should apply the same remedy, having a good opinion of it for this purpose, and also as it acts as a manure.—(S. F.)

After a failure of Swedes through being eaten off by fly, a part of the ground resown with Yellow Turnips was again attacked, but some *gas-lime*, not long from the works, was powdered fine and gently sprinkled over the Turnips in the morning *before the dew was off*, which saved a fair crop.—(J. R.)

In garden cultivation I have found not perfect success, but mitigation of attack follow on sprinkling well with *gas-lime* that had been exposed for several weeks to the air.—(Ed.)

In one locality in the neighbourhood of St. Albans, where the fly-attack was noticed as severe on the Swedes early in the season, *salt* was at once applied broadcast at the rate of four hundredweight per acre, which at once cleared the fly, and a heavy and regular crop of Swedes ensued.—(F. S.)

VARIOUS METHODS OF DISTURBING, REMOVING, OR CATCHING THE TURNIP FLY.

Rolling; driving sheep through the infested plants when the dew is on; brushing with boughs.—The point of many of these applications being made when the dew is on is very important, not only because under these circumstances the dressings adhere to the leaves, but also when the fly or flea beetle has its limbs clogged by moisture it cannot use its hind legs for its long flea-like jumps; consequently much larger numbers of fly remain in reach of the dressings.—Different method of using boards or canvas smeared with tar, or other sticky material, for catching the fly are also described.

It is my invariable practice, when I see the plants attacked, at once to run a *light roll* over them. The operation is not pleasant to these troublesome insects.—(C. H.)

Rolling often saves a piece of Turnips; it dusts the young plants, and “firms” the soil to the injury of the fly, but to the benefit of the Turnips.—(W. J. E.)

A process which has been practised with marked success by various farmers in the neighbourhood of Ilminster is, when the plants have got their second leaf, and the fly has made its appearance, to *roll them* with a heavy horse-roller *between one and two o'clock of a summer's morning*, when it is just light enough to see where to go. In some cases the process has to be repeated at a fortnight's interval, but usually one rolling is enough.—(G. T. B.)

DRIVING SHEEP.—From observations I found that the fly does not feed freely on dusty plants; so I have been in the habit of *driving a flock of sheep* over the field as soon as the plants appear. This I found very beneficial, as, if done *early in the morning*, when there is a *little dew* on the young leaves, the fine dust adheres to them, and the fly will not feed on them until they have been washed. This remedy will not act in rainy weather, but neither does the fly then work, or if it does the plant soon outgrows the injury. If the sheep are driven about on the land more than once they will do no harm, only a few plants will be disturbed. This remedy is a very simple one, and I have certainly found it efficacious.—(J. T.)

Relatively to the same practice, I was favoured, in 1877, with the following communication:—

The field of Turnips I *drove sheep* over was thirty-seven acres; number of sheep, 400 to 500. I think by so doing I quite saved the plants, as the fly was then very strong on the young Turnips, then from four to five weeks old, and evidently meant to clear the lot. This is no new thing, as I have many times done so, and thereby saved the

crop, which is in no way injured by the treading. The only injury is to the sheep, as they are not willing to be treated so, and require a dog to be used to keep them together, and at the same time make them take all the ground in turn. We drive the sheep over part of the field one day and part another, as it does sheep harm to keep them long without food, and also to drive them early in the day; and this should be done at five in the morning, when the dew is on the leaf.—(R. P. T.)

BRUSHING THE PLANTS WITH BOUGHS.—In the Thame district, Oxfordshire, the following plan was found successful in saving a good crop on one farm, whilst those around failed:—After the seed had been sown and was beginning to show out of the ground, the farmer employed a boy with a *thorn-bush*, who harrowed up and down the drills occasionally until the plants were strong enough to bear up against the fly. The bush-harrowing so disturbed them that they had not peace to get on with the destruction of the plants, and, so far as the crop was concerned, the light harrowing seemed to do no harm whatever.—(T. B.)

Elvaston, Derbyshire. We have several times saved the crop on ridges by having some *green boughs* drawn along their tops once or twice a day for several days; this dislodged the fly, and greatly curtailed the depredations.—(G. M.)

The plan of catching the fly- or flea-beetle by means of some viscid matter was recommended and practised by Professor Buckman many years ago, and in his excellent paper on insects which injure the Turnip crop, published in the 'Field,' June 26th. 1869, he gives the description of a machine for this purpose, simply made and easy to work. "It consisted of three light boards of sufficient united breadth to cover five rows of roots. These were banded together by two stouter cross-pieces fore and aft, the ends of which were formed into axles, on which ran low, turned wooden wheels." A pair of handles were fixed at one end, and the broad board on its wheels was so light that a boy could push it over the Turnips, "In this way we did as much as twenty acres a day in the dry summer of 1864, killing myriads of Turnip beetles and some two-winged flies, which were scraped off in masses from time to time, and fresh thin tar painted over the under part of the machine. By this means we saved our crop, when all around us failed."

In the notes I have been favoured with from Prof. Buckman, he mentions:—

I should have used the machine for the main crop this year, but from the cause stated I had no occasion to do so.—(J. B.)

The following method of clearing young plants of fly is the same as the above in principle, and is mentioned as serviceable:—

I nailed two boards together about twelve feet long and four

to seven inches wide, to the end of which I attached the small wheels of a three-furrow drill, and put some handles to it to push it along like a seed-barrow; some bagging was nailed on the flat board to be just above the ground; this was kept well-tarred, and, as it is pushed in front over the rows of young plants at a brisk pace, the fly, in jumping from the plant, comes in contact with the tarred bagging, and sticks there. Thousands may thus be soon caught, and a man can go over five or six acres twice in a day.—(C. C.)

A short note mentions fly being caught by wheeling a board to cover two rows painted with treacle or any sticky substance which the fly would adhere to, and thus be got rid of.—(F. W.)

The following plan, similar in principle to those above mentioned, but worked on a much larger scale, has been contributed, as mentioned by Prof. Allman to have succeeded:—

A large board, say the size of a dining-table, should be placed on wheels high enough just to clear the top of the Turnip drills. The under side of this board is to be covered with tar (pitch), and then dragged by horses over the field. The beetles naturally spring up and are caught in the tar.—(Communicated by R. S. S.)

The following observations show success to plants on well-cultivated land, with guano applied by means of the water-cart in dry weather; mention also is made of sea-weed as a manure.

From Lake Carra, near Killarney. Here, on a gravel (red sand-stone) and peat soil, there are good Turnips with no "fly" either in Swedes or Aberdeens. These were on deep-ploughed ridges, on Potato-ridges of 1880, prepared by spade-labour; these 1880 beds put on the furrow of similar ridges of 1879, thus getting out stones to make way for its first ploughing in 1881. These were partly manured with well-rotted farm manure, cow-manure on furze bedding, partly with red sea-wrack (the kind used for "kelp," locally known as red-weed), and two bags of guano were watered, by means of the water-cart, on to the young Turnips in dry weather, which took root quickly and thrrove. Food-plants of fly were absent, the surroundings being mainly bogs, heath, trees, and Potato patches, and no wild Mustard.—(J. B. K.)

I have noticed beautiful fields of Turnips, where, in rotation with other crops, seaweed has been used.—(J. S.)

Observations regarding injury to promising plants on well-prepared ground by fly coming out of neglected surroundings; also of fly-attack being interrupted, and freedom from fly-attack occurring, respectively, at a portion of differently-manured ground.

I manured the whole (fifty-two acres) with farm-yard dung, sixteen cart-loads, and four hundredweights of artificial manure per acre. I got a splendid mould on the land,—a fine state for sowing, neither too wet nor too dry,—got good braird each time, but just to be devoured in a day or two. The insects seem to be worse where they get shelter. In one field, one-half Potato, the other Turnip, a number of drills next the Potatoes were entirely eaten off, not a single plant left; whilst the remainder gave about half a crop; and in another, where a dyke, hedge, and ditch run alongside, with a quantity of grass growing betwixt the hedge and dyke, a number of drills next this fence were similarly eaten off to those next the Potatoes. In another field a very peculiar incident happened:—Being four days in sowing it, on the fourth day I carted on the cotter's dung, and spread it in drills the same as the farm-yard dung, treating it the same as my own in every way, excepting that there was no addition to this of artificial manure, and it was cold, whereas my own was in a heated state; also I used the same seed. The first-sown part of the field was the first brairded, and also the first attacked by fly, and so on with each day; but when they came to the part manured with the cotter's dung they thinned the first drill; of the second they ate only a few, passed over the remainder, and attacked mine on the other side, and ate them to such an extent that I had to resow them, with most of the field. Now the cotter's few drills are a very good crop, whilst the rest is very blanky (on some acres not a Turnip), being eaten up by fly the second time.—(D. H.)

On a field of twenty acres of Swedes, one-half was drilled with manure and dissolved bones, the rest with dissolved bones only, and two ridges near the middle of the field with manure from a privy and ash-pit. The fly was troublesome on the whole field, but not so bad as to necessitate resowing, except the two ridges, on which they took every Turnip.—(W. S.)

At Goldsborough, Knaresborough, where it is observed by the contributor that he is not aware that he ever saw the fly so numerous before, a piece of Tares was noticed as gradually looking worse for three weeks, and on examination fly was found to be at work. There was not any weed noticeable in the field, certainly not Charlock, and when the Turnips adjoining got up (when the first-sown were about a week old) the fly appeared on them, and entirely left the Tares for the Turnips. From the condition of the Tares it appeared that the fly

had been on them during the greater part of April. Attack of fly to this crop is noticed as a circumstance never observed before, and that probably the fly would not have eaten the Tares if there had been anything else to be had.—(L. P. O.)

Haltica rufipes is noticed by Kaltenbach in his 'Pflanzen feinde' as infesting Tares, and this species of fly is also mentioned in 'Illus. Brit. Ent.' by J. F. Stephens as rather local, but found near York, and in Northumberland.—(Ed.)

HEREFORDSHIRE.

SUMMARIES OF TABLE AND REPORTS.*

The following table contains information regarding attack of Turnip Fly in Herefordshire, together with methods of cultivation and other points of treatment found serviceable in prevention of this pest. The notes numbered 1 to 38 on this table have been contributed from parishes lying in a district of a radius of seven miles round Leominster, for the most part on alluvial or gravel soil, or, where this is not the case, on clay, or clay to loam.

Pages 89, 90, give fuller details from districts lying north, south, east, or west in Herefordshire, and, together with the foregoing, give a fair idea of the amount of attack in the county, and show that the same principles of cultivation are acted on that are recommended by good agriculturists elsewhere.

Nos. 1 to 38.—Working the ground early in the year, with various details of treatment to keep in moisture, is noted at Nos. 5, 10, 14.

The advantage of late sowing is noticed at Nos. 5, 9, 14, 24, 26, and 35; of thick seeding at Nos. 12, 15, 29, 37, and 38.

The use of Mustard in drawing off the fly-attack at No. 35; the desirableness of a fine seed-bed and sowing after rain at No. 38; and of a fine seed-bed, with forcing manures, at No. 12.

Light-rolling, frequent rolling as soon as the crop appears above ground, and rolling when the dew is on, are noticed at Nos. 3, 11, and 12; and liberal application of dissolved bones and frequent horse-hoeing, at No. 23.

With regard to steepings or dressings for seed, mention is made of crystal oil and dusting with sulphur, at No. 3; of paraffin having been found serviceable after some three years' trial, at No. 20; and of carbolic powder drilled along with flour of sulphur and soot with the seed, at No. 25.

Dressings of lime, also of soot, and of lime and soot mixed in equal parts, and applied as soon as the plants appear, are noted as desirable at Nos. 16 and 17; as also sprinkling with lime at No. 27; and lime and ashes, when the dew is on, at No. 30.

Absence of fly attack is noticed as occurring on the part of a field where there was burnt soil under, at No. 33; and the use of Elder-boughs fastened on scufflers for brushing away fly when the dew is on, at No. 2.

* The following notes of information are, by desire, given only with the names of the localities, not those of the senders, to whom I offer my thanks, together with my acknowledgments to Mr. J. H. Arkwright, of Hampton Court, Leominster, through whose valuable assistance I was favoured with the contributions.—Ep.

Reports from various districts (following the table) give notes regarding amount of attack; also of desirableness of good cultivation beforehand; and of such methods of treatment as may preserve the moisture in the soil at sowing-time.

Rolling to firm the soil is advised, and also a fine tilth, and the desirableness of an ample supply of seed is particularly dwelt on, as well as plenty of manure.

The importance of suitable weather and state of ground at sowing-time is shown by the difference in crop consequent on this in the different parts of a field treated alike, except in difference of one or two days in date of sowing. (This point, which is very important, is worked out more at length in the table of information from Borough-bridge, York, Ep.)

The use of Mustard to attract the fly from the Turnips, as mentioned at p. 71, and of a machine of boards drawn over the field freshly painted at each turn, so as to catch the fly in springing from the plant, similar in principle to the tarred boards noticed at p. 81, is also noted as serviceable.

The following details of cost of cultivation of Swede Turnips *per acre* in two localities of Herefordshire are given, by permission, for convenience of reference to non-agriculturists, with regard to some of the points to be considered in forming estimates. It will be observed that half the cost of the manure, carting and spreading (calculated *per account rendered*), has been deducted; as in the case of *Turnips* this serves for the following crop also:—

Particulars and cost of cultivating Swede Turnips per acre, 1881.

THREE FARMS AT PENCOMBE.				£	s.	d.
Ploughing twice	...	...	...	1	4	0
Harrowing twice; crushing; scuffling, rolling, and ploughing (third time)...	...	...	...	1	0	6
Bouting out twice; carting and spreading manure; sowing artificial, and drilling seed	...	...	...	1	2	8
4 lbs. Swede seed at 10d.	...	...	...	0	3	4
4 cwt. artificial manure at 8s. per cwt.	...	...	...	1	12	0
12 cart-loads manure at 5s. per load	...	...	...	3	0	0
Second time scuffling, harrowing, bouting, drilling	...	...	...	0	11	8
4 lbs. Swede seed at 10d.	...	...	...	0	3	4
Scuffling hoeing, thinning, gathering, hauling	...	...	...	1	2	0
				9	18	8
Deduct half cost of manure, carting, &c., as above	...	...	...	2	11	6
Total				7	7	2
Estimated produce 15 tons, at 10s. per acre, consuming price	...	...	...	7	10	0

The following particulars are from a farm on which, for the past six or seven years, the contributor has regularly sown Mustard seed with the Swede seed, and has never failed to get a good crop of plants, and has had no occasion to sow a second time:—

BODENHAM (England's Gate).				£	s.	d.
Ploughing twice	...	...	...	1	6	0
Scuffling; rolling; bouting and drilling	...	...	...	0	16	0
Loading, carting, and spreading dung, and sowing artificial manure	...	...	...	0	11	3
5½ cwt. artificial manure, as per bill	...	...	...	2	6	6
7 loads manure, at 5s. per load	...	...	...	1	15	0
Scuffling Turnips three times; hoeing, thinning, topping, and butting; loading and hauling	...	...	...	1	6	0
3 lbs. Swede seed at 1s. 4d. per lb.	...	...	...	0	4	0
1 lb. Mustard seed	...	...	...	0	0	6
				8	5	3
Deduct half cost of manure, carting, spreading				2	6	4
Total cost				5	8	9
Good crop, estimated 15 to 20 tons (say 15)						
at 10s. per acre, consuming price	...	...	...	7	10	0

On other farms in the same locality near Leominster, of which details of cultivation have been returned, the cost of the second sowing has been respectively 15s. and 15s. 6d. per acre.

It will be noticed that consuming price is set at 10s.; selling price is estimated at 15s. to 20s. per ton for the Swede Turnips.

HEREFORDSHIRE.

Swede and Turnip Crops of 1881. Damage done by Fly in Leominster District.

No.	PROPORTION DAMAGED.		PROPORTION RESOWN.		Remedies suggested, and Remarks.
	Partially.	Entirely.	Amount.	No. of times.	
1	... 4 acres ...	... 6 acres ...	... 6 acres ...	Once	Have not found any remedies to do much good. Some believed to be saved by fixing Elder-boughs to the Turnip scafflers, and so brushing the young plants when the dew was on. In other years moistening the seed with crystal oil, and drying it again by mixing sulphur, has succeeded. One-fifth escaped, but no reason can be assigned except the above application, combined with light rolling. Common Turnips were not attacked by fly at all. The seed was dressed as above.
2	... One-half ...	One-sixth	One-sixth	Once	
3	... One-fifth ...	... One-fifth once. Two-fifths twice.	Three-fifths One-fifth	Once Partially	
4	—	Three-fourths	Three-fourths	Once	For remedy working the ground down early in the spring to keep it damp is suggested. Only reason apparent for crops having escaped is their being planted late.
5	Three parts.	A quarter	A quarter	Three times	
6	5 acres	... 15 acres ...	... 15 acres ...	Once	
7	11 acres	... 4 acres ...	... 4 acres ...	Once	Crops pretty good at last, but without suitable weather would have had nothing. Sometimes a little soot or lime sown on them in the dew will help to keep the fly off. Reason of escape of crop may be very late planting. In general the fly is most prevalent early in the season. On heavy clay work ground before, and thus break it early (say March); work it up for roots nine days prior to planting, and cheat the fly, who will go away "with tears in their eyes."
8	—	... 20 acres ... (the whole).	... 20 acres ... A part	Once	
9	About ... 2 acres.	—	... None ...	Twice	
10	—	 All	 All	Twice	Rolling when the dew is on checks the fly to some extent. No sure remedy; a fine seed-bed, forcing manures, and thick seedling will generally push the plant past the fly; also frequent rolling as soon as the crop appears above ground does good.
11	30 acres	... 17 acres ...	... 17 acres ...	Once	
12	Whole	About half.	About half.	Once	
13	—	... 8 acres ...	... 8 acres ...	Once	Has about twenty acres of Turnips, all very good. Land was well cultivated and manured early, and, after being ploughed twice, made very fine and let remain rolled down for about nine days before planting. This treatment, and not planting too early, considered a great preventive against the fly.
14	About ... 2 acres.	—	... About 2 ... acres.	Once	

15	... About ... a quarter.	—	About 1 acre Gaps filled	... Once 4 or 5 times.	A good preparation for seed-bed; not less than three pounds of seed to the acre; and liberal application of artificial manure. The first week in June the best time for planting.
16	... About ... a quarter.	A quarter ..	One-eighth One-eighth	... Twice ... Thrice	Found this year that, by giving a slight dressing of slack-lime as soon as the plant is seen in the drill, the fly would not touch it. Soot answers the same purpose, but lime preferred. Seven acres of Turnips escaped; weather was favourable, and plants grew too fast for the fly to hurt them.
17	—	Three-quarters of Swedes (half-crop).	Half of root-crop.	... Once	A light dressing of equal portions of lime and soot when just showing out of ground.
18	—	 All	 All	... Once	Have tried several things, but to no purpose.
19	 All	One-half in this neighbourhood.	About a quarter One-half .. Some of the farms	... Twice ... Once	Unacquainted with any remedy.
20	... Very few ...	None	Only about a quarter of an acre.	... Twice ... Once	Steeped the seeds in paraffin, as I have done for some three years, and think the plant comes stronger; and the fly injures considerably less. Crop was very good.
21	—	... 2 acres ...	... 2 acres ...	... Once	Not able to suggest any unless planting early, say first two weeks in May.
22	... 7 acres ...	—	 All	... Once	
23	... Not estimated.	Not estimated.	... 3 acres	... Twice	Liberal application of dissolved bones to commence, and frequent horse-hoeing.
24	—	6 acres of Swedes.	... Some 6 acres ...	... Once	
25	—	The whole of the Swedes.	The whole	... Once	Common Turnips were not attacked by fly, being planted later, and more favourable weather having set in.
26	Early sown.	—	—	—	28 lbs. of carbolic powder was used, together with the same quantity of flour of sulphur, and a bushel of soot (drilled with the largest cups of the Turnip drill), which kept the flies away till the rain washed it off, and then they attacked the plants and destroyed them. The second crop was planted the second week in June, which is a good crop.
27	... Three-quarters.	An eighth	About three-quarters.	... Once	
28	... 20 acres ...	8 acres	... 8 acres	... Once	Considered that Swedes are sown too early in that locality. Sprinkling with lime early when the dew is on the plant.
29	... 15 acres ...	2 acres	... 5 acres	... Once	
30	All more or less.	—	About 12 acres	... Twice ... Once	Ten acres escaped fly-attack. No remedy known, unless it be giving plenty of seed. Sow lime and ashes, mixed in equal proportions, on the young plant early in the morning when the dew is on. This is believed to have saved four acres, a quarter of the sixteen sown.

HEREFORDSHIRE.

(Continued).

Swede and Turnip Crops of 1881. Damage done by Fly in Leominster District.

No.	PROPORTION DAMAGED.		PROPORTION RESOWN.		Remedies suggested, and Remarks.
	Partially	Entirely	Amount	No. of times.	
31	Half	Half	4 acres	Once	Only remedy known is rain, when fly is eating the crop. Believed that burnt soil will partially prevent the fly. The two acres that escaped out of eight had burnt soil under them.
32	—	The whole	The whole	Once	
33	1½ acres	4½ acres	4½ acres	Once	
34	—	11 acres	11 acres	Once	By sowing late (say end of June) and putting plenty of manure and a little Mustard seed, which comes up quickly, the fly gorges to its heart's content whilst the Swede is in its infancy. In ordinary seasons prefer sowing Swedes from 14th to 21st of June.
35	—	10 drills about 10 chains long.	10 drills	Twice	
36	3 acres	2½ acres	2½ acres	Once	
37	—	12 acres	12 acres	Once	No remedy known. Four acres were planted with about 2 lbs. of seed extra to the acre, and they escaped the fly.
38	—	3 acres	3 acres	Twice	One thing is, they ought to be put in after rain, and not in the dry; next, to put plenty of seed, and the ground to be fine and firm, Many are afraid of putting too much seed, but a thick plant always grows faster than when it is thin.

Note.—The returns from Leominster District are from parishes lying in a radius of seven miles from Leominster.

HEREFORDSHIRE.

(Continued).

Swede and Turnip Crops of 1881. Damage by Turnip Fly in Districts specified.

EARDISLEY.—Principally gravel.

Amount damaged and resown—First sowing of Swedes wholly damaged throughout this district, and a large area of the second sowing. The succeeding crop was pretty good and regular, but not of the usual weight per acre, from being late.

Remedies suggested, and Remarks.—Do not consider there is any remedy, by reason of the effect of seasons and of atmospheric influences; when the seasons will allow the land to be thoroughly prepared for the seed, and a rapid vegetation and growth follows, the fly is powerless.

With regard to the reason why some crops have escaped, should say that no sufficient reason can be given further than the good fortune to get the seed in when the tilth and weather suit, as experience proves that a difference of forty-eight hours will affect it. Consider early sowing more liable to injury than late.

TARRINGTON.—Strong loam; some clay marl.

Amount damaged and resown.—All the early-sown Swedes were damaged, and nearly all had to be resown. The Turnips being later, did not suffer very much.

Remedies suggested, and Remarks.—No remedy known. The best method of dealing with the fly is to have the land fine, sow very thick, and stimulate the growth of the Turnip as much as possible by manures, &c. Where the land is clean, think it a good plan to work it fine, and allow it to lie rolled down in dry weather for a week or two, then plough and drill every day, if practicable; when the land is moist and fresh turned-up, simply stimulate the early growth as much as possible. No reason known for escape of special crops beyond a favourable state of the land, and of the weather, which varies from day to day.

PENNOXSTONE, ROSS.

Gravel, and sandy loam on red sandstone.

Amount damaged and resown.—This district suffered much from fly; many crops had to be resown two or three times.

Remedies suggested, and Remarks.—Have tried many experiments, some with a little, but none with complete success.

MARLOW, LEINTWARDINE.—Loam on limestone ; part light.

Amount damaged, and resown.—Estimated that three-quarters of the Turnip acreage of the neighbourhood has been damaged by the fly, and about one-half resown : in many instances resown twice.

Remedies suggested, and Remarks.—The only remedy known is to get the land well ploughed in the autumn, and keep the moisture in by scuffling only, in the spring, and making it as fine as possible before sowing. There should be an ample seeding and manuring, and, just as the seed is coming up, spread on about forty bushels of *hot* lime to the acre. This treatment is noted with regard to light land.

Can give no reason for some crops escaping the fly, except the particular time of sowing and the situation. Have often noticed where a field has been sown at twice with only a day or two between, and all cultivated and manured alike, that one part may be very good and the other very bad ; in some seasons little damage is done by the fly, where the work is well executed ; but this year all appear to have suffered alike, which I never remember before.

PENCOMBE.—Clay and clay-loam.

Amount damaged and resown.—All the Swede crop damaged, and almost the whole of the Swede ground resown, some of it twice ; some was resown the second time with White Turnips. The White Turnips do not seem to have suffered much damage.

Remedies suggested, and Remarks.—Thick sowing is suggested as most likely to save the crop, Sowing Mustard or White Turnip seed with the Swedes (by the side of them) is also proposed. Sowing soot or dust early in the morning over the young plants, if constantly repeated, would no doubt check the damage.

Rolling with a light wooden roll when the leaves are moist (as practised in some parts of Norfolk) would have the same effect, if repeated when the leaves of the plant had become free from dust.

BROCKHAMPTON, near BROMYARD.—Clay on sandstone.

Amount damaged and resown.—Sowing took place three times in several cases ; in some four times.

Remedies suggested, and Remarks.—I sow on the flat, if possible without ploughing the land in the spring, and roll down as firm as possible, as I find the Swedes come away much quicker out of the way of the flea if the land is really firm. With regard to reason of special crop escaping, part of a field was accidentally drilled with the Mangel-barrel, and of course was four times too thick ; that part, though covered with fleas, recovered ; the rest of the field sown with the Swede-barrel had to be resown. I think I saved many of mine by having a board on very low wheels drawn quickly up and down the field, and having a curtain suspended from it to the ground to make the fleas jump against the board, which was fresh painted at each turn ; I certainly killed thousands, and my Turnips lived.

SUFFOLK.*

Damage by Turnip Fly and Grub in Weybread Parish, &c.

This table gives information contributed by twelve of the farmers in the parish of Weybread, Suffolk, and one in the adjoining parish of Fressingfield, for which I am indebted to the help of the Rev. H. J. White, Vicar of Weybread.

No remedies were tried in any case, nor was the seed in any case put in with the water-drill, nor the water-cart used.

Of these thirteen farms only two escaped fly-attack, on Swedes and Turnips, Nos. 1 and 6: in the case of the first the Turnips did not come up at the first sowing, and resowing was late; in the second the use of salt, at the rate of three hundredweight per acre, is noted, and also that it was light land. At No. 4, though attack was bad, it is also observed that the crop on light land was good.

At No. 2 there was bad attack on both Swedes and Turnips, and the Swedes were only half a crop; whilst the Turnips, similarly managed in all respects excepting that exactly *double the amount of seed* was sown, were a full plant, and the crop was good, though late.

Nos. 5 and 10 both suffered severely, although a good amount of seed was sown; but it will be observed that the state of tilth was not considered satisfactory by the contributors, who only note it as "fair."

At No. 11, where there is an entry of "sheep-folding only," and at No. 12, where "burnt earth only" is mentioned as having been applied to the Turnip, fly was bad, and there was "no crop" of Turnips; but the Swedes, with the help of farmyard and artificial manure, together or separately, did much better, giving half a crop in one case, although badly attacked, and escaping attack in the other.

At No. 13 the loss was total, but Mustard sown instead of Swedes, which were destroyed, gave a good crop.

* In the case of the Suffolk table the amount of information with which I was kindly favoured being furnished (as given) in tabulated form, I regret not being able to offer fuller details as to calculation of money loss; also in eleven of the twenty-six series of entries a difficulty arises with regard to the especial object of this paper from loss by "grub" being recorded together with that of the "fly." It will be observed, however, that of these eleven entries eight mention amount of crop, and one mentions no crop (also of Swedes) without any record being made of resowing; consequently the only considerations of resowing affected appear to be the entries of "Turnips sown twice" at Nos. 8 and 9. These observations refer also to a portion of the remarks, p. 50, lines one to three from the top.—ED.

At Nos. 2, 3, and 5, the Turnips appear to have suffered less than the Swedes; whilst at Nos. 7, 8, 9, 10, 11, and 12, though both suffered and Swedes were very deficient, Turnips appear to have been a total failure, "no crop at all" being the terse and sad record on the sheet of original contribution from these six farms.

It is manifest the attack was general and severe over this district, and further details as to previous cultivation and points of treatment would have been very serviceable. Without these it would be unsafe to offer any opinion, but looking at the general view, some of the worst among the severe cases appear to have been where there was no application of manure, or farmyard manure only was given without superphosphate, which observations elsewhere show to be of much service in giving a good start to the first growth; also the amount of seed used appears less than what is considered desirable in other districts, at the estimate that a pint of Turnip seed weighs about 12 ozs., or $\frac{1}{4}$ lb.

SUFFOLK.

No.	Crop.	Amount of seed per acre.	State of tilth.	Manures.	Attacked by Fly, Grub.	Amount of loss per acre.	Money loss.	Remarks.
1	Swedes Turnips	1½ lb.	Fine.	Bone superphosphate and farmyard ..	No..... ..	None	..	{ Turnips did not come up; resown. First sowing end of June.
2	Swedes Turnips	1½ pt. * 3 pts. ...	Fine. ...	{ 10 loads of farmyard, and 2 cwt. of } bone superphosphate per acre. }	Yes+ Yes.....	½ crop No loss, but late ...	£3 ..	{ Turnips not resown, and, although badly attacked by fly, a full plant.
3	Swedes Turnips	2 pts. ...	Fine.	Farmyard only	Yes..... Yes.....	½ crop..... ½ crop.....	£5 .. £5 ..	Three sowings of Turnips.
4	Swedes Turnips	3 pts. ...	Fine.	Farmyard only	Yes..... Yes.....	½ crop on heavy land Good on light land.	£5 .. £5 ..	Three sowings of Turnips.
5	Swedes Turnips	4 pts. ... 3 pts. ...	Fair. ...	{ Farmyard, and Turnip artificial } manure	Yes..... Yes.....	No crop 1-10th loss by fly ...	? ..	{ Turnips estimated at ½ crop. 1-10th loss from fly; further loss effects of season
6	Swedes Turnips	2 pts. ...	Fine.	{ Farmyard. Salted Swedes and } Turnips 3 cwt. per acres	No..... No.....	No attack "	? ..	Light land.
7	Swedes Turnips	3 to 4 pts. "	Fine. ...	Farmyard..... Artificial Turnip manure	Yes..... Yes+...	½ crop No crop	? ..	Two sowings of Turnips.
8	Swedes Turnips	2 pts. ...	Fine.	Farmyard and artificial.....	Yes..... Yes.....	½ crop No crop	? ..	Turnips partly sown twice.
9	Swedes Turnips	2 pts. ...	Fine.	Farmyard only	Yes+ Yes+...	½ crop..... No crop.....	? ..	Turnips sown twice.
10	Swedes Turnips	4 pts. ...	Fair.	Farmyard only	Yes+ Yes+...	½ crop..... No crop	? ..	Turnips sown three times.
11	Swedes Turnips	4 pts. ...	Fine.	12 lbs. farmyard, 4 cwt. artificial... Sheep-folding only	Yes+ Yes.....	½ crop..... No crop	? ..	Turnips sown twice.
12	Swedes Turnips	3 pts. ...	Fair.	Farmyard and artificial separately ... Burnt earth only.....	No..... Yes+...	No crop	? ..	Turnips sown twice.
13	Swedes Turnips	3 pts. ... 2 pts. ...	Fine. ...	Farmyard, 14 loads per acre		Loss total	{ ? .. }	{ Mustard sown in lieu of Swedes, and fine crop resulted.

* 1½ pint equals about 1 lb. 2 ozs. A pint of Turnip seed weighs about 12 ozs., or ¾ lb.

+ The sign of addition is affixed where the attack was bad.

FLY-ATTACK ON ROOT CROPS AT BROOM CLOSE, BOROUGHBRIDGE, YORKSHIRE, IN 1881.

WHITE TURNIPS.

SOWING.		MANURE.	WEATHER AT TIME.	GERMINATION.	FLY ATTACK.	QUALITY AND RENT OF LAND.	REMARKS.
Date.	No. of Acres.						
Plot 1 May 21	4	5 cwt. of dissolved bones per acre. No fold - yard manure	Dry	Came up quickly	Fly commenced attack at once	Light sand on red sandstone Turnip and Barley soil	About three-quarters of the necessary plant left by the fly. This Plot and Plot 2 were dressed exactly the same, the ridging-plough going immediately before the drill which sows manure in the ridge immediately below the seed.
Plot 2 May 28	4	Same as above	Heat and droughty	Came up at once	Never touched by fly, excepting a dozen or so of ridges adjoining Plot 1	Same soil as above. Rent of Plot 1 & 2 50s. per acre	Plot 2 fit for the hoe quite a week earlier than Plot 1.
Plot 3 June 21	10	Rotten fold-yard manure	Showery		Not attacked by fly	Strong clay, not adapted for roots. Rent 30s. per acre	Land in anything but good condition for Turnips, as it worked very rough. Plants fit for the hoe by the 11th July. An excellent crop.

S W E D E S .

Plot 4 May 19	8	One half the field green manure from yards, there- mainder rot- ten from heap, and 5 cwt. of dis- solved bones per acre	Very warm & dry until 24 May, when we had rain	Came up badly	Fly ate them all	Strong-bodied soil twice ploughed & ridged	Considered that this field being eaten off may be explained by the ridges having got dried through, so that the plants did not start simultaneously.
SAME Plot June 11	Re- drilled			Came up irregularly	Partly eaten off		These never thrive from the beginning; were not fit for the hoe until the 19th of July, and are a very poor crop.
Plot 5 May 25 & 26	11 drilled on the flat	One half of this field rot- ten manure from heap, & the remain- der green manure from yards. All, 5 cwt. of dis- solved bones additional	Showery on night of 24th		Fly took the whole of the plant	Land was in capital con- dition for re- ception of seed, and a good strong loam on clay	This field had been steam-cultivated, and dragged during winter as opportunity offered. The manure applied at once and ploughed in (the only time the land was ploughed).
SAME Plot June 23, 24 & 27.	Re- drilled			Came away at once	No fly on 2nd crop		One more ploughing.
Plot 6 (part of same field) May 28	5		Very heavy thunder-rains on night of 26th, which prevented getting on the land before	Came well	Never touched by fly		An excellent crop. These two Plots (5 and 6 in one field) were treated exactly the same way.
Plot 7 June 4 & 6	12	Green manure from yards applied in the ridges, and 5 cwt. of dis- solved bones	Rain fell on 6th directly the field was finished, then two cold days followed by growing wea- ther		No fly ever on this	Light land on gravel, well adapted for roots. Rent 50s. per acre	Drilled in ridges after Oat-stubble, land ploughed, and ridged. Plants grew rapidly, and were hoed by July 15th. We had a great crop of Swedes, con- sidering the season.

YORKSHIRE.

SUMMARY OF TABLE.

This table gives particulars, contributed by Mr. W. Scott, from Broom Close, Boroughbridge, Yorkshire, regarding attack of Turnip Fly, including dates of sowing and germination, and is of great value, showing the effect of well-moistened soil in pushing on the plant so as to drive it past the power of the fly.*

It will be observed that the first sowings of plot 4 on May 19th, plot 1 on May 21st, and one sowing of plot 5 on May 25th and 26th were attacked, and plots 4 and 5 entirely eaten off: the weather at sowing-time being noted at the various dates as being warm and dry; dry; and showery on the night of the 24th.

From the rainfall returns it appears that the total amount of rainfall during April (at Aldborough, Boro-Bridge) was only 0.74 in.—that is, somewhat less than three-quarters of an inch; and from the 1st until the 19th of May the fall only amounted to 0.82. This small amount of rainfall would be rapidly absorbed or evaporated, and the consequence would be a dry ground much more suitable for fly presence, as observed, than growth of the young Turnips.

Plots 2 and 6, both drilled on May 28th, after *such a heavy thunder-rain on the night of the 26th as prevented getting on the ground* sooner to continue work, were never touched by fly, excepting a dozen or so of ridges in plot 2, next the infested plot 1; and this absence of fly is especially important to observe in the case of plot 6, as this is part of the same field as plot 5, of which we thus see that the part sown before the thunder-rain of the 26th was taken *entirely by fly*, and the part of which the sowing was delayed two days by this rain was never touched, and gave an excellent crop. This rainfall amounted to 0.54 in.,—that is, rather more than half an inch, representing a fall of rather more than fifty tons per acre,—and must have completely soddened the surface, consequently set up a supply of moisture for a few days, which would do good, both at the roots and by evaporating round the young plants, which it will be noted respectively “came up at once” and “came well,” and thus were carried on till the rainfall seven days later, from the 4th to the 8th of June, occurred to help vegetation, followed by successive rains from the 15th.

Plot 7 sown on June 4th and 6th, plot 3 sown on June 21st, and plot 5 redrilled June 23rd, 24th and 27th, were sown when rainfall was recommencing on the moistened land, or was well established,

* For the returns of rainfall at Aldborough, Boroughbridge, that are appended I am indebted to the courtesy of the Rev. R. W. Marriott.

and on these plots there was *no fly-attack*, although in the case of plot 3, sown on June 21st (when it will be seen there had been *good rainfall* for some time), the ground was in anything but good condition for roots on account of its working rough.

The second sowing of plot 4, which was re-drilled on June 11th, came into the period at which others throve, and was "partly eaten"; but, looking at the bad amount of fly previously present on the ground, this partial destruction seems likely enough; and also, in this case, sowing and re-sowing took place, respectively, on May 19th and June 11th, so that there was not as good an interval between as in the satisfactory re-sowing of plot 5. In this case the first sowing, which was destroyed, took place on May 25th and 26th, and the second, which was not attacked on June 23rd, 24th, and 27th, thus being put in after a longer space of time, including in it rainfalls of more than a quarter of an inch on several days.

Note.—Page 66, line 14, "an implement called a K."—The name is "Koldmoos Weed Eradicator"; it is described as a horizontal drum revolving at high speed between two carrying wheels; the drum being furnished with rows of combs protruded and withdrawn by machinery, whereby the weeds entangled amongst the teeth are either pulled up or the flowering heads torn away.—ED.

RAINFALL AT ALDBOROUGH, BOROUGHBRIDGE, YORKS, 1881.			
Date.	April.	May.	June.
1	Total Rainfall of April, 0·74 in.	ins.	ins.
2		Amount registered from	—
3		1st to 13th is total Rain-	—
4		fall during this period.	0·20
5			0·01
6			0·42
7			0·07
8			0·01
9			—
10			—
11			—
12			—
13		0·26	—
14		0·19	—
15		0·11	0·01
16		0·03	0·27
17		0·12	0·26
18		0·01	0·20
19		0·10	—
20		—	0·22
21		—	0·28
22		—	0·46
23		—	—
24		0·18	0·17
25		—	0·05
26		0·54	—
27		—	—
28		—	—
29		—	0·10
30		—	—
31		—	—
Total	0·74	1·54	2·73

Contributed by the Rev. R. W. Marriott.

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 Turvil, D.
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