T. Pl.ziekten 64 (1958): 263–268

SOME OBSERVATIONS ON DISEASES OF *PISUM SATIVUM* IN SEVERAL EUROPEAN COUNTRIES IN 1957 [1])

Met een samenvatting: Enige waarnemingen aangaande erwteziekten, die in 1957 in Europa optraden

BY

D. J. HAGEDORN [2])

INTRODUCTION

During the summer of 1957 the writer had the opportunity to visit a substantial number of fields of peas, *Pisum sativum*, in England, Germany (West), The Netherlands, Sweden, and Switzerland. Plants were examined and notes were taken as to which pea diseases were present. An estimate was made of the per cent of plants attacked by each disease in each field. The approach was conservative. Unless a disease could be diagnosed with reasonable certainty it was not counted. Estimates were always on the conservative side and were often made in consultation with others. The results were interesting and perhaps significant since some diseases found had not been previously noted or reported in several of the countries visited. This short paper will report these observations.

SCOPE AND RESULTS OF THE OBSERVATIONS

Visits to European pea fields began in The Netherlands on June 28, progressed through Switzerland, West Germany, and England, and ended in Sweden on August 2. Both commercial and experimental pea fields were visited. The results of the observations made on pea diseases are summarized in table 1. When it was estimated that less than 1 per cent of the plants in a field were attacked by a particular disease, the word "trace" was used to designate the amount of infection. Other disease categories and the percentage of plants infected were – slight, 1–4 per cent; moderate, 5–10 per cent; severe, 11–25 per cent; and very severe, 26 per cent or more.

The Netherlands: A total of 25 pea fields were visited in The Netherlands mostly on June 28 and 29, and July 1, 2, and 6. Observations were made in most of the important pea growing areas of this country, including Zeeland, Limburg, South Holland, North Holland, and Gelderland.

Nine diseases were found in the pea fields of The Netherlands during this brief survey. The most important disease noted was top yellows caused by the top yellows virus (DE FLUITER & HUBBELING, 1955) many times in combination with foot or rootrotting Fusaria. The virus diseases pea streak, caused by several different viruses (HAGEDORN & WALKER, 1954; QUANTZ & BRANDES,

[1]) Accepted for publication 19 March, 1958.

[2]) Associate Professor, Agronomy and Plant Pathology, University of Wisconsin, Madison, Wisconsin, U.S.A., National Science Foundation Senior Post-Doctoral Fellow. Institute for Phytopathological Research, Wageningen, The Netherlands, 1957.

1957), and enation mosaic (HAGEDORN & WALKER, 1954) also appeared to be quite widespread. Of particular interest was the observation in one field of peas showing symptoms of the pea stunt disease, caused by the red clover vein-mosaic virus (HAGEDORN & WALKER, 1954). The presence of this virus in one of its other hosts, red clover, *Trifolium pratense* L., was later confirmed. Perhaps the most heavily damaged field was found in Zeeland where very severe losses were suffered due to eelworms, *Heterodera goettingiana* (OOSTENBRINK, 1955). Other pea diseases found included: Ascochyta blight, *Ascochyta* spp. (HARE & WALKER, 1944); wilt, *Fusarium oxysporum* form *pisi* race 1 (LINFORD, 1928); downy mildew, *Peronospora pisi* (CAMPBELL, 1935); and mosaic, pea virus 2 or bean virus 2 (HAGEDORN & WALKER, 1954).

Switzerland: A total of 39 pea fields were visited in Switzerland on July 3, 4, and 5. Most of the observations were made in the vicinities of Frauenfeld

TABLE 1. Some observations on diseases of *Pisum sativum* in Europe in 1957.
TABEL 1. *Enige waarnemingen aangaande erwteziekten, die in 1957 in Europa optraden.*

Country and disease *Land en ziekte*	Number of fields in disease category indicated *Aantallen velden, gerangschikt naar de mate van aantasting*				
	Trace [1]	Slight	Moderate	Severe	Very severe
The Netherlands (25) [2]					
Ascochyta blight/*vlekkenziekte*	1	2	–	–	–
Wilt/*Amerikaanse vaatziekte*	1	1	–	1	–
Downy mildew/*valse meeldauw*	–	5	1	–	–
Enation mosaic/*enation-mozaïek*	–	13	4	–	1
Mosaic/*mozaïek*	1	7	2	–	–
Streak/*strepenziekte*	–	13	1	1	–
Stunt/*dwergziekte*	1	–	–	–	–
Top yellows/*topvergeling*	–	3	10	1	–
Eelworm/*aaltjes*	–	–	1	–	1
Switzerland (39)					
Bacterial blight/*bacterieziekte*	1	6	–	–	–
Ascochyta blight/*vlekkenziekte*	1	–	–	–	–
Fusarium root rot/*wortelrot*	1	1	–	–	–
Wilt/*Amerikaanse vaatziekte*	1	–	–	–	–
Downy mildew/*valse meeldauw*	5	4	–	–	–
Enation mosaic/*enation-mozaïek*	9	3	–	–	–
Mosaic/*mozaïek*	1	–	–	–	–
Streak/*strepenziekte*	12	6	–	–	–
Stunt/*dwergziekte*	6	–	–	–	–
Top yellows/*topvergeling*	5	4	–	–	–
Water congestion/*waterophoping in intercellulairen*	–	3	–	–	–

[1]) Trace/*spoor* = –1 % plants infected/*zieke planten*
Slight/*licht* = 1–4 % „ „ „ „
Moderate/*matig* = 5–10 % „ „ „ „
Severe/*sterk* = 11–25 % „ „ „ „
Very severe/*zeer sterk* = 26%+ „ „ „ „

[2]) Numbers in parenthesis refer to total number of fields visited in the various countries. *Getallen tussen haakjes geven de aantallen velden weer, die in de desbetreffende landen werden bezocht.*

Table 1, continued

Country and disease *Land en ziekte*	Number of fields in disease category indicated *Aantal velden, gerangschikt naar de mate van aantasting*				
	Trace [1])	Slight	Moderate	Severe	Very severe
West Germany (11)					
Fusarium root rot/*wortelrot*	1	4	2	–	–
Enation mosaic/*enation-mozaïek*	–	4	3	–	–
Mosaic/*mozaïek*	–	–	3	1	–
Streak/*strepenziekte*	–	6	4	–	–
Stunt/*dwergziekte*	1	1	–	–	–
Top yellows/*topvergeling*	–	2	3	–	–
Water congestion/*waterophoping in intercellulairen*	–	1	–	–	–
England (14)					
Fusarium root rot/*wortelrot*	–	–	3	–	–
Wilt/*Amerikaanse vaatziekte*	–	–	1	–	1
Downy mildew/*valse meeldauw*	–	1	1	–	–
Enation mosaic/*enation-mozaïek*	–	8	7	–	–
Mosaic/*mozaïek*	–	1	3	–	–
Streak/*strepenziekte*	–	5	5	–	–
Stunt/*dwergziekte*	–	1	–	–	–
Top yellows/*topvergeling*	–	3	3	–	–
Sweden (22)					
Ascochyta blight/*vlekkenziekte*	1	1	–	–	–
Fusarium root rot/*wortelrot*	–	2	2	1	–
Downy mildew/*valse meeldauw*	1	3	2	–	–
Enation mosaic/*enation-mozaïek*	–	1	–	–	–
Mosaic/*mozaïek*	–	2	–	–	–
Streak/*strepenziekte*	1	–	–	–	–
Stunt/*dwergziekte*	1	–	1	–	–
Water congestion/*waterophoping in intercellulairen*	–	–	3	3	–

[1]) See notes table 1, page 264.

and Hallau to the north and northeast of Zürich. Others were made near Zürich.

Although 11 different pea diseases were observed in Switzerland none of them were very important. No fields were observed with more than a slight amount of any disease. Perhaps the most important disease was pea streak. Its incidence was quite common being found in 18 fields, though always in trace or slight amounts. Downy mildew, enation mosaic and top yellows were also quite widespread. It was interesting to note the occurrence of the pea stunt disease in six fields because the causal virus, red clover vein-mosaic virus, was also found in red clover. In addition to finding the diseases noted in table 1, two other maladies were observed in the Hallau area particularly. They were hail injury, and stem rot due to fungus rotting of the long pea stems lying on the ground. The nonparasitic disease called water congestion (HAGEDORN, 1957), believed caused by inability of the plant to transpire enough water, was found in slight amounts in three fields.

Germany (West): Only 11 pea fields were visited in Germany between July 9 and July 12. The area most widely surveyed was west and southwest of Braunschweig, in the northeastern part of this country.

Seven pea diseases were in evidence in this area. They included Fusarium root rot, *Fusarium solani* var. *pisi* (JONES, 1926; SNYDER & HANSEN, 1941), enation mosaic, streak, stunt, top yellows (called „leafroll" in Germany) and water congestion. In addition, one field contained many prematurely yellowed plants which showed some symptoms of the near-wilt disease, *F. oxysporum* form *pisi* race 2 (SNYDER & WALKER, 1935), but other atypical symptoms made field identification too hazardous so no reference to this field is made in table 1. The streak disease appeared to be the most important. It was found causing moderate infection in four fields and slight infection in six other fields. The enation mosaic disease and Fusarium root rot were also quite common. The nonparasitic disease called water congestion was found only once in slight amounts.

England: Pea fields in England were visited during the period July 16 through July 20. A total of 14 fields were studied, mainly in the Essex, Norfolk, and Huntingdon counties north and northeast of London. A few observations were also made in Warwick county northwest of London.

A total of eight different pea diseases were noted on this brief survey. Five were caused by viruses; three by fungi. The diseases found included Fusarium root rot, wilt, downy mildew, enation mosaic, mosaic streak, stunt, and top yellows. The virus diseases appeared to be more widespread with the enation mosaic disease and the streak disease very much in evidence. The former ranked, on the basis of these limited observations, as the most important disease found. The wilt disease, an important one in England commercially, was found in only two fields but in one it was very severe – most of the plants in the field were severely attacked. The eelworm disease of pea, also important in England, was not seen on this particular survey.

Sweden: Observations on pea diseases in Sweden were made from July 22 through August 2. A total of 22 pea fields were visited mainly in southern Sweden near Malmo, Landskrona and Halsingborg and somewhat farther north toward the east coast near Norrköping and Linköping. A few observations were made near Uppsala.

Pea diseases were not observed to be particularly important in Sweden. The water congestion disease was the most widespread disease found. The plants in three fields showed moderate damage and in three other fields severe injury. The Fusarium root rot disease was perhaps second in importance, and downy mildew third. Virus diseases were not especially important except in one field near Malmö where at least 5 per cent of the plants showed very typical, severe symptoms of the pea stunt disease. Other pea diseases found included Ascochyta blight, enation mosaic, mosaic and streak.

Others: A negligible number of pea fields were visited in Belgium, northern France, and in Denmark. It was interesting to note the occurrence of slight amounts of Fusarium root rot and streak in Belgium, enation mosaic in France, and Ascochyta blight in Denmark.

SIGNIFICANCE OF THESE OBSERVATIONS

These observations were very interesting and very likely quite accurate from the standpoint of which diseases were present in the various countries visited. However, their accuracy is questionable in some cases so far as the relative importance of the various pea diseases within any one country is concerned. For most countries the number of areas surveyed and the number of fields studied in any area would have to be larger before real accuracy could be claimed. Likewise each field would have to be very thoroughly studied. In this survey some fields were not studied in such a manner.

The observations described here are significant because in some countries certain pea diseases were found, or are being reported here, for the first time. Where any question of such a "first" was concerned the appropriate authorities were consulted. In The Netherlands the pea stunt disease was diagnosed for the first time during these studies. The following pea diseases found in Switzerland are being reported here for the first time: enation mosaic, mosaic, streak, stunt, top yellows, and water congestion. If Dr. TINSLEY's monograph on the virus diseases of the Leguminosae is still unpublished this will be the first report of the occurrence of pea stunt and top yellows of peas in England. The following diseases occurring in Sweden are hereby reported for the first time: enation mosaic, mosaic, streak, stunt, and water congestion.

ACKNOWLEDGMENTS

Sincere appreciation is expressed to the following without whom these observations could not have been made: The National Science Foundation, Washington, D.C.; Dr. VAN DER WANT, Ir. HUBBELING, and Ir. LAMMERS, Wageningen, The Netherlands; Dr. MUNZ, Dr. GFELLER, Lenzbourg, Switzerland; Dr. SCHREIBER, Braunschweig, Germany; Mr. REYNOLDS, Yaxley, England; and Dr. OSVALD, Mr. OTTOSSON, and Mr. SVEN HOLMBERG respectively of Uppsala, Bjuv and Norrköping, Sweden.

SUMMARY

Observations on the occurrence of diseases of pea, *Pisum sativum*, in five European countries in 1957 are reported. Areas visited, numbers of fields studied, and appropriate dates are indicated. The pea diseases found, together with estimates of the amount of infection by each are given. No accuracy of relative economic importance of the diseases is claimed but significance is attached to the finding of certain pea diseases for the first time in several of the countries visited.

SAMENVATTING

In 1957 bezocht de schrijver erwtevelden in Nederland, Zwitserland, West-Duitsland, Engeland en Zweden en noteerde de mate, waarin de desbetreffende gewassen door een aantal ziekten waren aangetast. In de waarnemingen waren de volgende ziekten betrokken: bacterieziekte, vlekkenziekte, Amerikaanse vaatziekte, Fusarium wortelrot, valse meeldauw, „enation"-mozaïek,

mozaïek, strepenziekte („streak"), dwergziekte („stunt"), topvergeling, aaltjes en waterophoping in de intercellulairen („water congestion"). De mate van aantasting werd geschat en als volgt uitgedrukt: spoor, minder dan 1 % van de planten ziek; licht, 1–4 % aantasting; matig, 5–10 % aantasting; sterk, 11–25 % aantasting; zeer sterk, meer dan 25 % aangetast. Tabel 1 geeft een overzicht van deze waarnemingen. Enige ziekten werden in sommige landen voor de eerste keer gevonden. Het betreft in Nederland de dwergziekte, waarvan het virus ook in klaver werd aangetroffen; in Zwitserland „enation"-mozaïek, mozaïek, strepenziekte, dwergziekte, topvergeling en waterophoping in de intercellulairen; in Engeland dwergziekte en topvergeling; in Zweden „enation"-mozaïek, mozaïek, strepenziekte, dwergziekte en ophoping van water in de intercellulairen.

REFERENCES

CAMPBELL, L., – 1935. Downy mildew of peas caused by Peronospora pisi (De B.) Syd. Wash. agr. Expt. Stat. Bull. 318.

FLUITER, H. J. DE & N. HUBBELING, – 1955. Waarnemingen over topvergeling bij erwten. T. Pl.ziekten 61: 165–175.

HAGEDORN, D. J., – 1957. Water congestion in canning peas. Phytopath. 47: 14.

HAGEDORN, D. J. & J. C. WALKER, – 1954. Virus diseases of canning peas in Wisconsin. Wis. agr. Expt. Stat. Bull. 185.

HARE, W. W. & J. C. WALKER, – 1944. Ascochyta diseases of canning pea. Wis. agr. Expt. Stat. Res. Bull. 150.

JONES, F. R., – 1926. Stem and root of peas in the United States caused by species of Fusarium. J. agr. Res. 26: 459–476.

LINFORD, M. B., – 1928. A Fusarium wilt of peas in Wisconsin. Wis. agr. Expt. Stat. Res. Bull. 85.

OOSTENBRINK, M., – 1955. Een inoculatieproef met het erwtencystenaaltje, Heterodera goettingiana Liebscher. T. Pl.ziekten 61: 65–68.

QUANTZ, L. & J. BRANDES, – 1957. Untersuchungen über ein Steinkleevirus. Nachrichtenbl. dtsch. Pflanzenschutzd. (Braunschweig) 9: 6–10.

SNYDER, W. C. & H. N. HANSEN, – 1941. The species concept in Fusarium with reference to section Martiella. Am. J. Bot. 28: 738–742.

SNYDER, W. C. & J. C. WALKER, – 1935. Fusarium near-wilt of pea. Zbl. Bakt. 91: 355–378.