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Joseph C. Gilman
Iowa State College

D. R. Porter
Iowa State College

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OBSERVATIONS ON PLANT DISEASES IN IOWA FROM 1924-1926

JOSEPH C. GILMAN AND D. R. PORTER

The diseases of plants especially those diseases due to the invasion of parasites are always markedly influenced by the environment and therefore any discussion of their occurrence in a stated period must also involve a discussion of the weather during that period. According to the reports of Reed,¹ the season of 1924 was characterized by a dry, cool spring, a rainy June and a cool summer. August was normal in temperature but with frequent heavy rains and September was unusually and persistently cool.

In 1925 the weather² was more nearly normal. March was warm but dry. The warmth continued into April with continued deficient rainfall. May showed great extremes and numerous changes in temperatures. It was the driest May on record as well. The drought was broken in June by heavy rains and the temperatures were slightly above normal. July and August were dry and hot. September was warm with heavy rainfall.

In a consideration of the season of 1926 the weather showed one outstanding difference from the average season in that, as reported by Reed,³ the precipitation was deficient until August while "September was the wettest month of any name in 54 years." The temperature of the spring, particularly March and April, was below normal while May, July and August were above the normal for the state. These peculiar conditions, particularly the spring drouth and cool temperatures, were of great influence on the occurrence of plant diseases over the state during the growing season. In many cases the incidence of the disease was delayed or primary infection was practically eliminated and therefore the disease in question became of minor significance.

The September rains on the other hand were of great importance as a factor in the occurrence and distribution of many of the fungi which attack their hosts at maturity such as the organism causing the dry rot of corn, *Basisporium gallarum* Molliard.

The relationships of these facts about the weather have been

¹ Reed, C. D. 1924. Climatological data, Iowa Section 35:97-98.

² Reed, C. D. 1925. Climatological data, Iowa Section 36:97-98.

³ Reed, C. D. 1926. Climatological data, Iowa Section 37:17-104.

correlated in so far as the data permitted and are brought together in this paper. For convenience of comparison the comparative temperatures for the three years considered are brought together in figure 1. The precipitation data is treated similarly in figure 2.

CEREAL CROP DISEASES

Barley. Usually the stripe disease (*Helminthosporium gramineum* (R) Erik.) and the net blotch (*H. teres* Sacc.) of barley are the most serious diseases of this crop in Iowa. In 1924 and 1925 they each reduced the yield by about 5 percent but in 1926 the dry weather especially that early in the summer checked the occurrence of both these parasites so that these diseases were of little significance during that season.

Anthracnose (*Colletotrichum cereale* Manns) which caused 5 percent damage in 1924 was less in 1925 (2 percent) and was not observed in 1926. Scab (*Gibberella saubinetii* (Mont.) Sacc.) followed a similar course being worse in 1924 than either the two other years.

Covered smut (*Ustilago hordei* (Pers.) K. & S.) was most severe in 1924. Undoubtedly its attack was favored by the warm dry weather of April in that year. In 1925, with more rain, there was less smut while in 1926 the rainfall was low again with a corresponding increase in the amount of smut present in the subsequent harvest. Doubtless the weather conditions at time of seeding are very important to the successful attack of this fungus.

Loose smut (*Ustilago nuda* (Jens.) K. & S.) was of about equal significance in each of the three years. It caused 1% loss in 1924 and 1925 and 2% in 1926.

The rusts, stem rust and leaf rust, (*Puccinia graminis* Pers. and *P. simplex* (Koern.) Erik. & Henn.) were also of minor importance during the three seasons under consideration. In 1924 there was but a trace of either, while in 1925 the stem rust showed 2% loss due to this cause. In 1926 the loss was only 1 percent. A trace of leaf rust was reported both of the last seasons.

It may be of interest to note that ergot of barley which is of rather rare occurrence was reported from the state in both 1924 and 1925.

Corn. Of the diseases which take toll of this important Iowa crop the Basisporium dry rot (*Basisporium gallarum* Moll.) was very serious in the three years under consideration. Doubtless the heavy precipitation during September after the partial maturing of the crop was one of the principal factors in the widespread

occurrence of this disease. The prevalence in the three years follow rather markedly the figures given for rainfall over the state. Thus with the small amount of September rain in 1924 there were but 2 percent of the ears infected; in 1925, with greater rainfall, there was an incidence of 8 percent, while with the extremely wet September of last year the percent of infection increased to 12 percent of the crop.

In the case of *Diplodia* dry rot (*Diplodia zeae* (Schw.) Lev.) the losses in 1924 and 1926 were heavier, 5 and 6 percent respectively, than those for 1925. As to the weather differences that might account for these variations the only distinct difference that might account for the checking of the fungus in 1925 was the early frost during September of that year.

Corn smut, *Ustilago zeae* (Beck.) Ung., the third important disease of corn from the standpoint of loss has increased during the three years. In 1924 the loss was 3 percent, in 1925, 4 percent and in 1926, 5 percent. No correlation with the weather conditions during these three years is evident.

The only other disease of corn that was widespread over the state was the rust (*Puccinia sorghi* Schw.) which has its aecidial stage on *Oxalis europaea*. This disease was of little economic importance in 1924 and 1926 but caused a 2 percent reduction in yield in 1925. It was noted by Mr. M. A. Smith who has had this parasite under observation during these years that the aecidial stage was very abundant in 1925, being favored in its development by the warm wet weather of June of that year. In 1926 the aecidial stage was noticeably checked by the spring drought; sufficiently perhaps to account for the reduced development of the rust on corn subsequently.

Oats. The loose smut of oats (*Ustilago avenae* (Pers.) Jens.) is the most serious disease of this crop. The losses reported for 1924, 1925 and 1926 were 5, 7 and 5 percent respectively. The warm dry weather for April, when the majority of the seeding is done, would largely account for the increased loss in 1925.

Oats blast, a non-parasitic injury, is next to smut the cause of great loss to the grower. Doubtless the dry weather of the spring was somewhat responsible for its increased severity in 1926, when 7 percent of the crop was destroyed by this trouble.

Halo blight (*Pseudomonas coronafaciens* Ell.) was the cause of 1 percent damage in 1925, when it was favored by the warm rains of June of that year.

Stem rust (*Puccinia graminis* Pers.) became epidemic in 1926,

TABLE I. LOSSES DUE TO PLANT DISEASES OCCURRING IN IOWA IN 1924, 1925, 1926

CROP	YEAR		
	1924 %	1925 %	1926 %
CEREAL AND FORAGE CROPS :			
<i>Barley</i>			
Ergot	Tr.	Tr.	0
Anthraxnose	5	2	0
Scab	2	1	Tr.
Stripe	5	5	Tr.
Spot blotch	Tr.	Tr.	Tr.
Net blotch	5	5	Tr.
Stem rust	Tr.	2	1
Leaf rust	Tr.	Tr.	Tr.
Covered smut	3	1	3
Loose smut	1	1	2
<i>Corn</i>			
Basisporium dry rot	2	8	12
Diplodia dry rot	5	2	6
Rust	Tr.	2	Tr.
Smut	3	4	5
<i>Oats</i>			
Halo blight	Tr.	1	Tr.
Scab	Slight	Tr.	Tr.
Crown rust	Tr.	Tr.	Tr.
Stem rust	Tr.	0.7	10
Smut	5	7	5
Blast	3	5	7
<i>Rye</i>			
Ergot	4	Tr.	0
Scab	Tr.	Tr.	Tr.
Leaf rust	Tr.	Tr.	Tr.
Stem rust	Tr.	0.2	Tr.
Stem smut	Tr.	0	0
<i>Wheat</i>			
Black chaff	Tr.	Tr.	0
Anthraxnose	2	Tr.	Tr.
Scab	5	Tr.	Tr.
Stem rust	Tr.	0.1	1
Leaf rust	Tr.	5	6
Bunt	2	Tr.	0.5
Loose smut	2	Tr.	1
<i>Alfalfa</i>			
Downy mildew	2	Tr.	0
Leaf spot	Tr.	1	Tr.
<i>Sorghum</i>			
Blight	2		
<i>Timothy</i>			
Rust	2	4	1
Smut	Tr.		
TRUCK CROP DISEASES :			
<i>Asparagus</i>			
Rust	6	6	3
<i>Beans</i>			
Anthraxnose	Tr.	Tr.	Tr.
Blight	2	5	Tr.
Mosaic	5	5	6
<i>Beets</i>			
Leaf spot	3	2	4

CROP	YEAR		
	1924 %	1925 %	1926 %
<i>Cabbage</i>			
Club root	Tr.	Tr.	Tr.
Yellows	20	20	30
Black rot	1	1	1
Black leg	1	Tr.	Tr.
<i>Cucumber</i>			
Anthraxnose	0	Tr.	0
Mosaic	15	7	15
Wilt	15	5	0
<i>Cantaloupe</i>			
Mosaic	5	5	6
Wilt	15	7	15
Anthraxnose	25	10	25
<i>Onion</i>			
Smut	2	Tr.	Tr.
<i>Potato</i>			
Black leg	3	3	1
Scab	5	5	2
Early blight	Tr.	Tr.	Tr.
Late blight	Tr.	Tr.	0
Mosaic	2	2	2
Black scurf	5	10	1
<i>Sweet corn</i>			
Rust	3	3	3
Diplodia	Tr.	Tr.	2
Basisporium	Tr.	Tr.	Tr.
Smut	5	6	7
<i>Sweet potato</i>			
Black rot	9	5	2
Wilt	25	10	8
<i>Tomato</i>			
Wilt	0	0	Tr.
Leaf spot	12	8	12
Mosaic	2	2	4
<i>Watermelon</i>			
Anthraxnose	15	20	25
Wilt	1	1	2
FRUITS:			
<i>Apple</i>			
Black rot	3	3	3
Blight	5	5	5
Scab	10	2½	1
Blotch	3	3	3
Rust	1	4	2
<i>Blackberry</i>			
Anthraxnose	3	1	Tr.
Rust	5	5	Tr.
<i>Cherry</i>			
Brown rot	5	Tr.	Tr.
Powdery mildew	5	5	3
Leaf spot	5	5	1
<i>Grape</i>			
Downy mildew	3	2	Tr.
Black rot		Tr.	Tr.
<i>Plum</i>			
Brown rot	25	unimp.	
<i>Raspberry</i>			
Anthraxnose	8	8	3
Crown gall	6	6	6
Mosaic	8	8	Tr.
Leaf spot	3	3	Tr.

causing a loss of 10 percent of the crop. The fungus was present over the state in June as was reported by various workers in the field, but did not assume epidemic proportions until just before harvest. Dr. S. M. Dietz found a few scattered pustules of the rust at Hubbard on June 7 and also at Ellsworth on June 11. Mr. L. D. Leach reported a similar condition at Chariton on June 11. As the oats were going into the dough stage a survey of the state showed that the central and northeastern portions of Iowa suffered more heavily from this disease: fields showing 25 to 40 percent infection were found in Warren, Polk, Story, Buchanan and Fayette counties. The distribution of the rust at this time is indicated on the accompanying map (Fig. 3) in which the percentage of infection is marked by crosshatching. A rather interesting correlation was noted between the rainfall during the first five days of July (Fig. 4) and the incidence of the rust. During the two previous years this disease was of minor importance.

Anthracnose (*Colletotrichum cereale* Manns.) was a cause of a trace of loss to oats in 1924 but was not observed in the following years.

Crown rust (*Puccinia coronata* Cda.) was present in all three years, being slightly more destructive in 1925 than in 1924 or 1926. Its destructiveness seems to be more dependent on the presence of the buckthorn, its alternate host, than is the case of stem rust and barberry. In 1926 the buckthorn infection was very light, due principally to the dry spring.

Rye. The ergot of rye (*Claviceps purpurea* (Fr.) Tul.) was a serious disease in 1924, causing a 4 percent reduction in yield. The cool wet weather of June when the crop was in flower, favored its development and spread. In 1925 a trace of the disease occurred while 1926 was notable for the absence of the parasite.

Leaf rust (*Puccinia dispersa* Erik.) and scab (*Gibberella saubinetii* (Mont.) Sacc.) were present in slight amounts in all three years. Stem rust (*Puccinia graminis* Pers.) was also of minor importance during this period and the stem smut (*Urocystis occulata*) was found only in 1924.

Wheat. The commonest and most serious disease of wheat in Iowa during 1924-1926 was the leaf rust (*Puccinia triticina* Erik.). A trace of loss was reported in 1924, 5 percent in 1925 and 6 percent in 1926. No correlation is present in the data available between its severity during the two last year's and the environmental conditions.

Stem rust (*Puccinia graminis* Pers.) which is much more feared

by the grower than is leaf rust, was not as destructive in any of the three years. In 1926 the barberries showed little or no early infection of stem rust but in certain areas of the state a late infection of barberry occurred. This late infection was not a factor, at least to any practical degree, in the incidence of the rust on wheat. It is problematical whether the barberry bushes, which are still in the state, were a factor in the rust situation in 1926 or not. In a few instances Mr. M. A. Smith, the state leader in barberry eradication, was able to trace local infected areas directly to barberries.

Anthracnose (*Colletotrichum cereale* Manns.) and Septoria leaf spot (*Septoria tritici*) were present in 1924, causing 2 and 1 percent loss respectively. In the following years these diseases were of little importance.

Scab (*Gibberella saubinetii* (Mont.) Sacc.) was severe (5 percent) in 1924 but did not appear in any appreciable amounts in 1925 or 1926. The excessive precipitation of June in 1924 possibly was an important stimulus to the attack of this fungus.

The smuts, loose smut (*Ustilago tritici* (Pers.) Rostr.) and bunt (*Tilletia foetens* (B & C) Trel.) were most abundant in 1924, least in 1925. Loose smut was very generally distributed over the wheat fields of the state causing from a trace to 2 percent loss. Bunt on the other hand was very spotted in its occurrence, being more severe throughout the winter wheat region of the state. In 1926 a survey was made of the bunt conditions and it was found that while the yield was reduced over the state by only one-half of one percent, in some fields severe losses occurred. In one field in Plymouth county 40 percent of the heads were infected and Dr. O. H. Elmer who made the survey frequently found 5 to 10 percent of the heads in a field destroyed by this smut.

Alfalfa. Winter injury in 1926 was by far the most serious trouble with this crop during the three year period just past. The wet fall of 1925 followed by the sudden advent of cold weather was very harmful to many alfalfa fields.

Downy mildew (*Peconospora trifoliorum* De By) was present in epidemic form in 1924, causing a 2 percent loss. It appeared during the wet weather in June of that year and was found again in 1925 in many fields but became inhibited by the drought of the later summer.

Clover. The commonest trouble on clover was the powdery mildew (*Erysiphe polygoni* DC.) especially on the red clover. Rust (*Uromyces trifolii* (Hedw.) Lev.) was found in slight amounts in 1924 and 1925.

Timothy. The rust of timothy (*Puccinia graminis* Pers.) was very severe in 1925, causing a reported loss of 4 percent. In 1926 one percent loss was found while but a trace occurred in 1924. The warm and wet June of 1925 might well be a factor in the severity of the rust during that season.

Sugar Beet. The leaf spot of sugar beets caused a two percent loss in 1924 and 1925 and a 3 percent loss in 1926. The wet fall caused the fungus to become very widespread and cause more than the usual damage.

TRUCK CROP DISEASES

Asparagus. The asparagus rust is the only disease of economic importance on this crop. It caused a 6 percent loss in 1924 and 1925 but only a 3 percent loss in 1926. The drought of 1926 was a serious limiting factor in the spread of this rust.

Bean. Mosaic disease was the cause of five percent loss to the bean crop in Iowa in 1924 and 1925; in 1926 it caused 6 percent reduction in the crop.

Anthracnose (*Colletotrichum lindemuthianum* (Sacc. and Magn.) Br. & Cav.) was present in small amounts each year, being severe in individual plantings, particularly in the wet Junes of 1924 and 1925.

The bean blight (*Pseudomonas phaseoli* EFS.) caused 2 percent loss in 1924, 5 percent in 1925 and only a trace in 1926. The drought of 1926 was largely responsible for the reduction of the loss in that year.

Beet. As in the case of sugar beets the leaf spot disease of garden beet (*Cercospora beticola* Sacc.) was more severe in its attack in 1926 than in the previous two years. The dry weather increased the injury caused by the parasite.

Cabbage. Cabbage yellows (*Fusarium conglutinans* Wollenw.) is by far the most serious cabbage trouble in Iowa. This disease is generally severe over a large part of the state and was much more destructive in 1926, when the loss was 30 percent, than in the two preceding years which showed a 20 percent loss due to this disease. The warm dry weather of July and August during 1926 was unfavorable for the growth of the cabbage plant and also stimulated the parasite. Iacope, the strain of cabbage developed by the Iowa State College Agricultural Experiment Station held its resistance to this disease even under the extremely unfavorable conditions of this season.

Blackleg (*Phoma lingam* (Tode) Desm.) was present to a

slight degree on seedling cabbages in the seed bed each year; black rot (*Pseudomonas campestris* (Pam.) EFS.) was present in the wet falls to the extent of 1 percent of damage. Club root (*Plasmodiophora brassicae* Wor.) was found in but two places in very reduced amounts during the period under consideration. These localities were Amana and Ackley.

Cucumber. The mosaic or white pickle disease was the most serious pest of this crop in the three years past. It caused 15 percent loss in 1924, 7 percent in 1925 and 15 percent in 1926. No correlation could be made between the occurrence of the epidemic and the environmental changes in these three years.

Wilt (*Bacillus tracheiphilus*) was severe in 1924, causing 15 percent loss, but was less in 1925, with only 5 percent. It was not observed last year.

Cantaloupe. Three diseases are destructive to cantaloupe in Iowa, mosaic, wilt (*Bacillus tracheiphilus* EFS.) and anthracnose (*Colletotrichum lagenarium* (Pass.) Ell. & Hals.). The mosaic disease caused 5 percent loss in 1924 and 1925 and 6 percent loss in 1926. This is in line with the mosaic disease on other crops; it was more severe in every case in 1926.

Wilt and anthracnose in contrast to mosaic were worse in 1924 and 1926. The wilt caused 15 percent loss and the anthracnose 25 percent loss in these two years. In 1925 the losses were 7 and 10 percent respectively. The greater rainfall of July and August in the two years of heavy infection was probably a factor in the incidence of this disease.

Potato. Potato diseases were all much reduced in 1926 as compared to 1924 and 1925. Blackleg (*Bacillus atroseptica* Van Hall) caused but 1 percent loss in that year as compared to 3 percent in the previous years. Scab (*Actinomyces scabies* (Thaxt.) Güssow) was reported as causing 2 percent loss as compared to 5 percent in both the previous years. Black scurf (*Corticium vagum* B & C) was responsible for 1 percent of the crop in 1926, while it caused 5 percent loss in 1924 and 10 percent in 1925. Doubtless the dry weather of the entire 1926 season was in large part responsible for the reduction of disease in that season.

Mosaic diseases caused a 2 percent loss each of the three years. Early blight was present each year but not serious and late blight was found in slight amount in 1924 and 1925. It was not found in 1926.

Sweet Potato. The wilt (*Fusarium batatatis* Woll.) is the most serious of the diseases of sweet potato, causing 25, 10 and 8 per-

cent loss in Iowa in the three years 1924-1926 respectively. Black rot (*Sphaeronema fimbriatum* (Ell. and Hals.) Sacc.) caused 9, 5 and 2 percent loss in the same years. These figures are inversely proportional to the rainfall in September in those years, as well as directly in line with the June precipitation.

Tomato. Among tomato diseases the leaf spot (*Septoria lycopersici* Speg.) is most serious in Iowa. In 1924 and 1926 it caused 12 percent loss while in 1925 the loss was but 8 percent. Doubtless the greater rainfall in July and August of the former years was somewhat responsible for these increases in the amount of disease.

Watermelon. Anthracnose (*Colletotrichum lagenarium* (Pass.) Ells. & Hals.) is the most serious disease of this crop. It caused 15 percent loss in 1924, 20 percent in 1925 and 25 percent in 1926. The wet weather of August in 1924 and that of September in 1925 and 1926 helped spread this disease. In some localities this disease caused a total loss of the crop in 1926.

Watermelon wilt (*Fusarium nivcum* EFS.) caused 1 percent damage in 1924 and 1925 and 2 percent in 1926. The drier weather of this last year accounts for much of the increase in damage, and in some fields as many as 90 percent of the vines were killed.

· FRUIT DISEASES

Apple. Scab (*Venturia inaequalis* (Cke.) Aderh.) which usually is the most serious of the diseases of apple was of little importance in 1926, causing only 1 percent damage. In the two previous years, 1924 and 1925, is caused 10 and 2½ percent damage respectively. The dry spring of 1926 prevented much ascospore infection and the continued drought held the disease in check. In 1924 and 1925 the June rains allowed an increase of the primary infections.

An interesting instance of the influence of the weather on the severity of plant disease was observed in connection with apple rust (*Gymnosporangium juniperi-virginianae* Schw.). This disease was present generally over the state, but was more destructive in the southwest corner than in the rest of Iowa. The severity of the epidemic followed very closely the amount of precipitation during May. Southwest Iowa received more rain as an area than the rest of the state except a small portion of the north central part where apple growing is less important.

Fire blight (*Bacillus amylovorus* (Bun.) Trev.) showed little variation in its destructiveness during the three years: 5 percent damage being attributed to its ravages.

Blotch (*Phyllosticta solitaria* Ell. and Ev.) like blight was con-

stant all three years, causing 3 percent loss. Mr. H. Nichols, Horticultural specialist of the Extension Division of Iowa State College, reported its occurrence north of Sioux City, which is farther north than it is often found.

More serious than the parasitic diseases of the apple was the severe winter injury that occurred on tender varieties of apple particularly Delicious, in many places over the state during the winter of 1925-1926. The injury usually took the form of body canker and the trees bloomed and came into leaf in an apparently normal manner in the spring. However, the foliage did not attain full size and frequently died with the drought conditions that occurred with the advent of warm weather. In a few cases the foliage continued to live but became light green or yellow and growth ceased. Often such trees showed the invasion of the blister canker fungus (*Nummularia discreta* Tul.) or black rot (*Phylospora malorum* (Pk.) Shear) was the follower.

Blackberry. Blackberry rust (*Gymnoconia interstitialis* (Schl.) Lagh.) is the outstanding disease of this crop in southern Iowa. It caused a 5 percent loss in 1924 and 1925, but only a trace of loss in 1926.

Anthraxnose (*Plectodiscella veneta* (Speg.) Burkh.) was severe in 1924, causing 3 percent loss, but in 1925 and 1926 its attack was checked by the dry weather of July and August. In the latter year the dry spring further contributed to its control. Therefore we find a 1 percent loss reported for 1924 and only a trace in 1926.

Cherry. While ordinarily brown rot (*Sclerotinia cinerea* (Bon.) Schröt.) is the most serious disease of cherry, it likewise was checked by drought in 1925 and 1926. It is most severe as a ripe rot and the dry seasons cut the loss to only a trace. In 1924 it caused 5 percent loss.

Cherry leaf spot (*Coccomyces hiemalis* Higgins) was severe in 1924 and 1925, causing a 5 percent loss each year. In 1926 it was reduced to a trace. Again much of the reduction may be attributed to the dry season.

Grape. Winter injury similar to that on apple was severe in 1926. Downy mildew of grape (*Plasmopara viticola* (B & C) Berl. and de Toni) caused 3 percent loss in 1924, 2 percent in 1925 and a trace in 1926. It also is very dependent on moisture and high temperatures for its greatest development.

Plum. Brown rot of plum (*Sclerotinia cinerea* (Bon.) Schröt.) like that of cherry was most destructive in 1924, causing a 25 percent loss. The wet weather of August of that year was largely

responsible, for in the drier years 1925 and 1926 the loss was reduced to unimportance.

Raspberry. Anthracnose (*Plectodiscella veneta* (Speg.) Burkh.) caused an 8 percent loss in 1924 and 1925. This loss was cut to 3 percent in 1926 due to the dry weather of the early summer.

SUMMARY

In summing up the plant disease situation for the three years 1924-1926 inclusive, it is evident that the weather plays an important rôle in the incidence of plant disease. These three years were alike in having drought periods in April and May. June was wet in the first two and July was average in the first and third years. In 1924 August was extremely wet while in 1925 and 1926 the wet weather did not arrive until September.

Temperature also played its part but not to quite such a marked degree. The differences were less and their influence upon the incidence of disease was therefore reduced. Cabbage yellows was more severe in the warmer years particularly in 1926.

Of the three years reported, the most outstanding was the last, 1926. As a whole this season was unfavorable to the serious development of many of the fungous parasites that are wont to occur on the crop plants of Iowa. In particular the drought conditions of early summer checked the primary infections of many fungi which depend on an ascus stage for their earliest attack. This condition held true for wheat scab, ergot of rye, apple scab, anthracnose of blackberries and raspberries and cherry leaf spot. Many bacterial diseases were checked during this season in a similar manner. Halo-blight of oats and holcus spot of corn were among this number. Further the aecidial stages of the heteroecious rusts also failed to function normally under these conditions. The wet fall however favored the occurrence of a serious loss to the corn crop by the growth of the ear rot organisms, *Diplodia zeae* and *Basisporium gallarum*. The smuts on the other hand were favored by the warm dry weather of April in 1925. The imperfecti such as cause anthracnose of melons and the leaf spot of tomato were aided in their spread by the rains of July, August and September.

Similar facts were evident in the preceding years. Thus in 1924 the rains in June were very favorable to epidemics of ergot of rye and black chaff and the halo blight of oats, stripe disease of barley, downy mildew of alfalfa and downy mildew of grape. Bean blight and bean anthracnose should also be mentioned as being favored by this heavy precipitation. Again in August the moist weather

increased brown rot of plums and the leaf spot of tomatoes as well as the anthracnose of cucurbits.

The year 1925 was in many respects like 1924 as to weather, although there were not the marked differences in precipitation and therefore the correlations between disease and moisture are not so easily distinguished. As a rule the dryer seasons of July and August reduced the diseases mentioned above that were favored by the rains the preceding year.

One of the outstanding facts of the disease situation in these years in Iowa was the severe winter injury to tender varieties of fruits and other perennial crops. The wet fall in 1925 following a rather prolonged drought induced renewed growth in many plants. The wet period was followed immediately by a rapid fall in temperature which caused severe injury among all the tender varieties of fruit, especially apples, cherries and plums. Peaches, many brambles and grape plantings were entirely destroyed. In some instances the injury was not evident until the following summer, particularly in those cases where it took the form of body canker. The injured trees set leaves and fruit which later did not develop.

IOWA STATE COLLEGE,
AMES, IOWA.

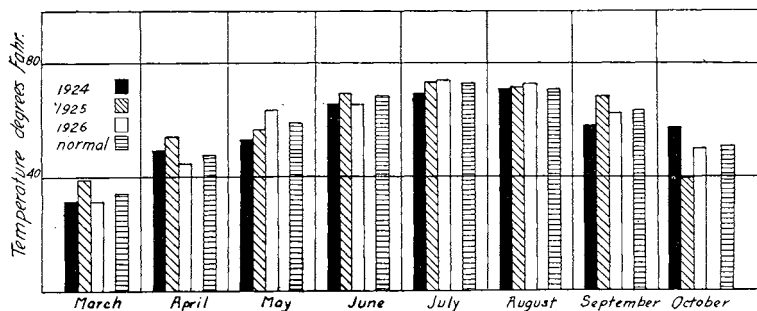


Fig. 1. Comparison of temperatures for Iowa by months. 1924-1926.

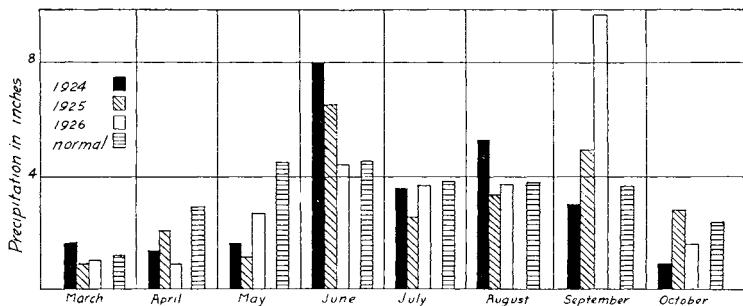


Fig. 2. Comparison of precipitation for Iowa by months. 1924-1926.

Incidence of Stem rust on Oats 1926

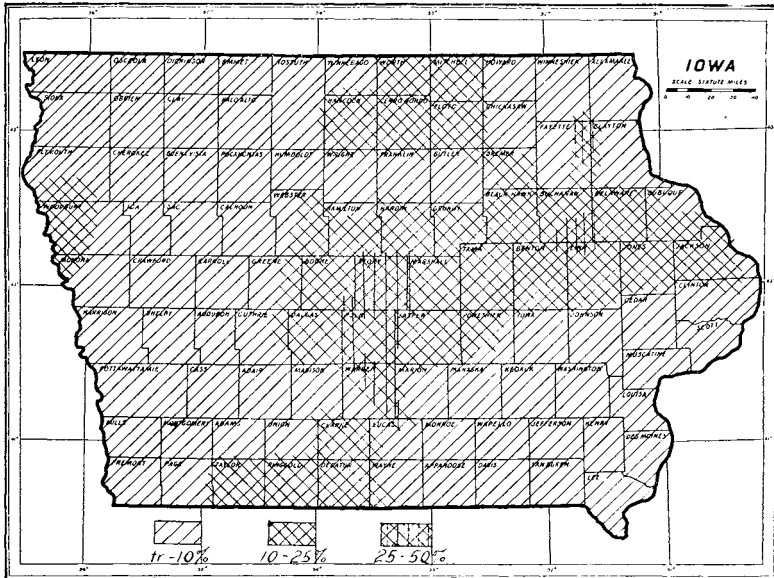


Fig. 3.

Precipitation July 1-5, 1926

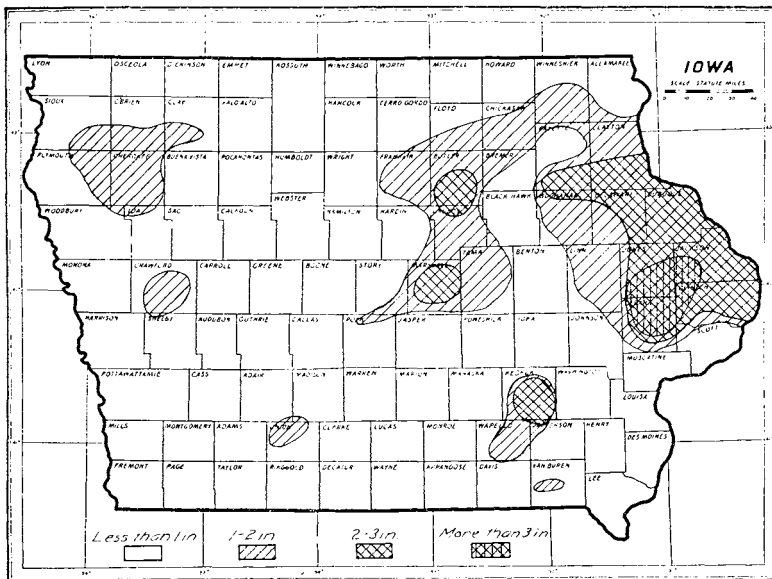


Fig. 4. Precipitation, July 1-5, 1926.