THE RELATION OF EAR ROT PREVALENCE IN ILLINOIS CORN FIELDS TO EAR COVERAGE BY HUSKS

G. H. Boewe

STATE OF ILLINOIS
Henry Horner, Governor
Department of Registration and Education
NATURAL HISTORY SURVEY DIVISION
Theodore H. Frison, Chief

Biological Notes No. 6

Urbana, May 20, 1936

Contribution from the Section of Applied Botany and Plant Pathology Leo R. Tehon, Botanist

(Publication No. 273)

Biological Notes No. 6

Biological Notes No. 6

Castackion darine bis 5-year pariol, 1931-(OS -To a daiment of the call the call the at avenue .

e 1 6

THE RELATION OF EAR ROT PREVALENCE IN ILLINOIS CORN FIELDS TO EAR COVERAGE BY HUSKS

G. H. Boewe

In the fall of 1930, while examining Illinois corn fields to determine the prevalence of disease, casual observation seemed to indicate to the writer that ears poorly covered by husks were much more readily infected by rot-producing fungi than those that were well covered. In the main, ear rots are caused by fungi, the spores of which are carried directly to the ears by various agencies, chiefly the wind, although some infection results from the fungi which grow from the stalk into the ear. An ear completely enclosed by its husks during the entire course of its development would appear to have been protected from external infection, while an ear not completely covered would appear to have been exposed to external infection. Yet ears poorly covered often escape infection and many well covered ears become infected.

It seemed worthwhile, therefore, to determine whether any relation does exist between husk coverage of the corn ear and the prevalence of ear rots in Illinois corn fields. Data bearing on this point have been accumulated by direct field examination during the 5-year period, 1931-1935, and a total of 57,395 ears have been examined in 297 fields. Corn fields have been examined each year in all parts of the state, except in 1931, when only fields in the central part were examined. The number of fields and the number of ears examined have varied from year to year, as shown in Table 1, but in general both the number of fields and the number of ears examined tended to be greater in each succeeding year. Records for the entire period show

THE HALASTON OF MAN POT PRINCIPULE

LATH SALIHOIS COME FIREDRY OF TAR COVERAGE BY MUSK

recorded with Brown the near the started with

202, these parts approve the color open well to be producted

In the fall of 1930, while examining Illinois corn fields to determine the

those that were well covered. In the main, car rots are caused by funci, the spores

of which are carried directly to the sers by various agencies, chiefly the wind, visit le included in the state of the sta

The time of exemination, to which and or the or the one of the or the order order

intections which require the mas of a continuous continuous in the continuous which require the mas of a continuous conti

It seemed worthwhile, therefore, to determine, whether any relation does

related to the the member of series have been enclosed by direct field point form and a total of 57,595 each have been excumined by direct field examination during the fiver portion, 1951-1955, and a total of 57,595 each have been examined if its 1,595 each have been examined to the first fields. Once fields in the central part when examined, The new state of the related and the mane of series examined from your to your, as shown in Toble 1, but in general both the number of series examined in the market of the surpoir of each examined in the market of the surpoir of each examined in the market in general both the number of series examined in Toble 1, but in general both the number of fields and the market of the outline ported show

that fields were examined in 69 of the 102 counties in the State.

DEFINITION OF TERMS

Throughout this discussion "covered" and "well covered" are to be understood as signifying that ears so classed were covered completely by husks, including the tips, and that the husks remained tightly closed until near harvesting. For the first 2 years, 1931 and 1932, these terms apply rigidly to ears observed to be completely and tightly covered by husks when the fields were examined. "Open," "not covered," and "not well covered" signify that ears so classed were not completely covered, but no distinctions have been made relative to the degree of partial coverage and none is implied by the various terms used.

Since the data are concerned with visually discernible ear rots, "ears with visible infection" and "ears without visible infection" constitute the 2 classes into which corn ears were assorted upon examination. Ears were considered to be rot-free if, at the time of examination, no visible mold or fungus sporulation appeared on or between the kernels or on the cob. Naturally, no account could be taken of the hidden infections which require the use of a germinator for determination.

RELATIVE ABUNDANCE OF COVERED AND OPEN EARS

Since most of the corn seed used in Illinois is produced by open pollination and is genetically heterozygous, it might be expected that covered and open ears would be found to occur in approximately equal numbers. However, an increasing number of farmers are practicing field seed selection, and, since this involves the choice of covered in preference to open ears, the expected ratio may not be secured. It is commonly believed, also, that weather and other conditions tend to influence ear length and size, thereby determining whether the cars will be covered or not by the supposedly uniform husks.

.etato edi ni asituros SOI edi lo 80 ni benimaxe evew ableil fadi

DEPTHITTON OF TERMS

Throughout this discussion "covered" and "beteves in a so to be understood

s signifying that ears so classed were covered completely by husks, including the

ips, and that the kwelks rock med thently closed until near harvesting. For the first

years, 1951 and 1952, these terms apply rigidly to ours observed to be completely

and tightly covered by hughs when the fields were exactned, "Open," "not covered,"

nd "not well; sovered"; atgulfy that ears so classed were not completely covered, but

al enon bas energy bare to seriob ed to be extended and enotionists on

aplied by the yardous terms used

dity eres" the date are concerned with visually discernible car rote, "cars with

detail and "ears without visible infection" constitute the 2 classes into

which corn cars were asserted upon examination. Ears were considered to be rot-free

Af, at the time of examination, no visible mold or fungus sporulation appeared on or

between the kernels or on the cob, Maturally, no account could be taken of the hidden

indisting which require the use of a germinator for determination.

BELATIVE ABUIDANCE OF COVERED AID OFFEE EARS

-salllog nego to be state of the come and the Illinois is produced by open politica-

den and the genebleally heperoxycomes it might be expected that covered and open care

ould be found to coose it approximately equal numbers, herever, an increasing num-

ter of farmers are presticing field seed solocion, and, since this involves the

sellishing as also feet severy the active one We marriedly an appropriation of the tenterior of

It is commonly believed, place that weather and other acaditions tond to influence .

yd fon to borevoo of fliw area add meddenwanining windered to covered water ben drymof was

de aupposodiy waifors busks,

In Illinois corn fields, as shown in Table 1, below, the number of open ears exceeds considerably the number of closed ears, in spite of the practice of selection and of any expected equality based on the genetic constitution of the crop. Over a

Table 1.-- Relative abundance of covered and open ears in Illinois corn fields, 1931-1935.

-	Fields	Ears	Number	of ears	Percent	of ears
Year	exam.	exam.	Open	Covered	Open	Covered
1931	26	7,800	5,314	2,486	68.1	31.9
1932	52	7,605	5,341	2,264	70.2	29.8
1933	51	9,300	5,300	4,000	57.0	43.0
1934	71	13,660	7,653	5,967	5613	43.7
1935	78	15,880	8,424	7,456	53.0	47.0
Total	278	54,245	An inferior part is delighted in the	disposition or an arrange		
Average	е				60.9	39.1

period of years, the average ratio of open to closed ears is almost exactly 3 to 2, and, although the ratio varies somewhat from year to year, the number of open ears exceeds the number of closed ears every year.

In a given year, considerable variation occurs in the relative number of open and closed ears in different fields, even in the same county. In Hancock County, for example, 2 fields examined in 1932 gave a ratio of open to covered ears of 4 to 1 and 2 to 3, and in Jasper County 2 fields gave ratios of 1 to 3 and 1 to 2. In 1934 and 1935, there was a larger average proportion of covered than of open ears in 5 fields in Piatt County, the ratio being 5 covered to 3 open ears, and in Edwards County in the same 2 years a ratio of 1.25 covered to 1 open was obtained.

Whenever the variety of corn in a field could be recognized, it was noted as a part of the data, and such records are combined in Table 2. Although the number of fields examined of each variety is small, a somewhat greater prevalence of covered ears is indicated for the Bloody Butcher, Calico, and Democrat varieties, while open ears predominate in the Krugg variety.

receds considerably the number of closed ears, is spite of the practice of welestion at any expected equality based on the genetic constitution of the crop. Over a

the sego to volume to the contract of the segon of the se

Pour						
8489-79	Hoo To		Manaber	dra	-Toldie	ty der
dereroo!				exem.	OKESTIA	test
			1.50			
8188	1 1 183		51314	008 7	831	Igel
9.08-1	8.05	- 2,264	1499,	- 7,605	52	1922-1
	0.78	4,000	00838			
	1	5,967	wast month to a series	18,660	The .	1984
	53,0			16,880	. 82	19891
	the same to be desired		e spermen problem		Despite actions a	Leto
1.68						

and, although the ratio varies comewhat from year to year, the number of open cars

open and closed ears in different fields, even in the same county, in Hancock County, or example, I fields examined in 1952 gave arrelie of open to covered ears of 4 to

Land 2 to 5, and in Jaspet Country 2 fields gave ratios of 1 to 3 and 1 to 2. In

conty in the seme 2 years; a retid of 1.25 downed to 1 open was obtained,

to a part of the data, the data and endounder one combined in Table 2, Although the number to revere to consider a security to seal as a security to seal

mego elide , selfelter taroomed bas , colled , redotus vacals ed not befaribal at any

ers productate in the Krugg variety.

Table 2.-- Prevalence of open and covered ears in some corn varieties.

Variety	Fields exam.	Ears exam.	Number Open	of ears	Ratio of open to covered ears
Bloody					
Butcher	2	200	64	136	1:2.1
Calico	4	700	322	378	1:1.2
Democrat	12	2,000	764	1,236	1:1.6
Krugg	2	502	325	177	1.8:1

FIELD PREVALENCE OF CORN EAR ROT

The presence of ear rot was determined in the field by pulling back the husks of each ear and examining it for the presence of fungus growth or sporulation, without removing the ear from the stalk. Ears that showed superficial characters of disease but no visible mold growth, as in Basisporium and some Diplodia infections, were broken to determine whether any mycelium, spores, or fungus fruiting bodies were present and were counted as rot-infected when these were found. Data were taken on this basis, which is designed to show the total field prevalence of ear rot regard-

Table 3.-- Prevalence of ear rot in Illinois corn fields, 1932-1935.

-	1		Number	of ears	Percent	of ears
Year	Fields exam.	Ears exam.	Rotted	Not rotted	Rotted	rotted
1001	1 O.Adin	Orteni	1000000	-	1	1
1932	48	7,005	3,911	3,094	55.8	44.2
1933	51	9,300	4,183	5,117	45.0	55.0
1934	71	13,660	12,359	1,301	90.5	9.5
1935	78	15,880	4,462	11,418	28.1	71.9
Total	248	45,845				
Average	e		1		54.8	45.2

less of particular causes, only during the 4 years, 1932-1935. A summary of them is presented above in Table 3.

Tron emos al area barevos bas mego to consievari --- S'eldat

	atte arrival a debat			
wvoo od mego	atee to			
ered ears	500000 1			
1				
108 - 101	225	11120		Vbool8
	1,236		000,8	

TOP SAST DESCRIPTION OF CORRESPONDED FRANCISCOPE

The presence of ear not was determined in the finite by pulling back the make of each ear and exemining it for the presence of fungus growth or sporelation.

Ithout removing the ear from the stalk. Ears that showed superficial characters of items of no visible mold growth, as in Resisportum and some Diplodia infections, one taken to determine whether any sycolium, spores; or fungus fraiting bodies.

This pasts, which is designed to show the total field prevalence of ear rot income.

				*48864		
.5.23. a				108,8	008,8	
of eara						
JOH .		T. Moh. 1		1000000	1 21616u	
	heddon, i					
					-	
	.,8*99.	8,094	2,911		84	1982
	0.84					2888
8,6	9.06		12,359	-18,660	27	
					248	Ladol
		A Commission			Jan Jan B	RATEVA

ess of particular causes, only during the 4 years, 1932-1935. A summary of them is

resented above in Table 3

Ear rot varied in prevalence from year to year, within wide limits, being least abundant in 1935, when 28.1 percent of the ears examined were infected, and most abundant in 1934, when 90.5 percent were infected. While various factors may have been concerned in these annual variations, as for example in 1934 when ear rot was undoubtedly greatly favored by prior damage done by corn ear worms, the significance of the ear rot problem in corn production is emphasized by the fact that of over 45,800 ears examined over a period of 4 years an average of almost 55 percent were visibly infected with one or another kind of rot.

RELATION OF EAR ROT PREVALENCE TO HUSK COVERAGE

Data on the relation of ear rot, without reference to particular causes, and husk coverage have been taken over a period of 3 years, 1933-1935, and are summarized in Tables 4 and 5. Among those ears not completely covered by husks ear rot prevailed, as shown in Table 4, to a high degree in 1933 and to an especially high degree in 1934, when the percentage of rot-infected ears exceeded the uninfected ears by nearly 85 percent; but in 1935 the rotted ears, while still constituting nearly a

Table 4	Prevalence	of ear	rot in corn	ears	not	completely
	covered by	husks,	1933-1935.			

Year	Open ears examined		of ears Not rotted		of ears Not rotted
1933 1934 1935	5,300 7,693 8,424	2,801 7,101 2,686	2,499 592 5,738	52.9 92.3 31.9	47.1 7.7 68.1
verag	е			59.0	41.0

third of the entire number, were less abundant than sound ears. In spite of these fluctuations, the average percentages for the 3 recorded years indicate a strong tendency for open ears to become infected more frequently than covered ears.

Among those ears completely covered by husks, ear rot prevailed to a high degree also, as indicated in Table 5, but the percentage of rotted ears was less than

Sar not varied in prevalence from year to your, within wide limits, being said abundant in 1935, when 28,1 percent were infected. While verious factors may not been concerned in these annual veriables, as for example in 1934 when car not as undoubtedly greatly favored by prior deings done by corm car verms, the significance of the ear not problem in porn production is emphasized by the fact that of more 45,800 care expendence a period of a years an average of almost 55 percent or visibly infected with one or another kind of rot.

For the 2 years in Relation of ear rot, without reference to particular causes, olean en. Data on the relation of ear rot, without reference to particular causes, and husk coverage have been taken over a period of 2 years, 1252-1255, and are even a retard in Tables 4 and 5, to a high degree in 1255 and to an especially bigh severe in 1254, when the percentage of rot-infected ours exceeded the enthfected ours exceeded the enthfected ours exceeded the enthfected ours.

		besove Chilling	
	Languagh	1 Sies deco.	
1.00		1938 5,500	
0.00 1 0.00		1 689.8) POSSET 3	•

int of the entire number, were loss abundant than sound ears. In spite of these

Adottations, the avorage percentages for the S recorded years indicate a strong tour

dand a of believery for use , saint of bereve violately come a no sould grown. . . .

logros also, as indicated in Table 6, but the percentage of retted ours was less than

the percentage of clean ears in both 1933 and 1935, while in 1934 the proportion of rotted ears greatly exceeded the proportion of clean ears. The average percentages

Table 5.-- Prevalence of ear rot in corn ears completely covered by husks, 1933-1935.

Year	Closed ears examined		of ears Not rotted		t of ears Not rotted
1933 1934 1935	4,000 5,967 7,456	1,382 5,258 1,776	2,618 709 5,680	34.6 88.1 23.8	65.4 11.9 76.2
Averag	9			48.8	51.2

for the 3 years indicate that, among covered ears, there is a distinct tendency for clean ears to predominate.

Of more significance, however, is the direct comparison given in Figure 1 of the percentages recorded in Tables 4 and 5. In each of the 3 years, regardless of

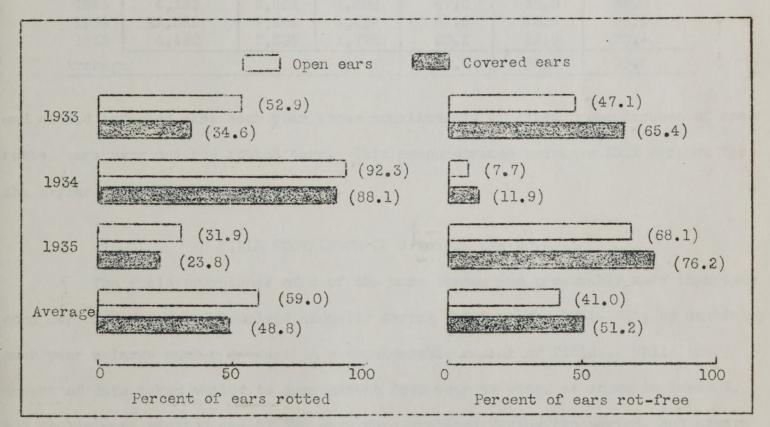


Fig. 1 .-- Prevalence and absence of ear rot in open and covered corn ears, 1933-35.

the percentage of close cars in both 1955 and 1855, while in 1954 the properties of gotten cars. The average percentiges

Table 5 .-- Prevalence of ear rot in corn cars completely

	-	* * * *			
1 0 100 10 0		8 780 70	rischall !	ares becold	
beddon doll.	Rotted	bedden dold	Rotted		
4.68. 2.11. 3.88	84.6 88.1 83.6	2,618		4,000	1935
8.13	6.84				

for the 5 years indicate that, smong covered ears, there is a distinct tendency for

.edanished of area med

rig. 1. -- Prevalence and absence of ear ret in open and covered corn cars, 1933-35.



Yeatter, Ralph Emerson. 1936. "Suggestions for Management of Upland Game in Illinois." *Biological notes* 5, 1–6.

View This Item Online: https://www.biodiversitylibrary.org/item/321192

Permalink: https://www.biodiversitylibrary.org/partpdf/358338

Holding Institution

University Library, University of Illinois Urbana Champaign

Sponsored by

University of Illinois Urbana-Champaign

Copyright & Reuse

Copyright Status: Public domain. The BHL considers that this volume is no longer under copyright protection

This document was created from content at the **Biodiversity Heritage Library**, the world's largest open access digital library for biodiversity literature and archives. Visit BHL at https://www.biodiversitylibrary.org.