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Studies on Inheritance of Hybrid Variance of Northern Corn Leaf Blight in Maize (Zea mayes L..)

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ABSTRACT: In present study was carried out to detect the inheritance of Hybrid Variance of Northern Corn Leaf Blight in Maize (Zea mayes L..).In this study it was observed that contribution of the lines towards total hybrid variance was found to be higher for northern corn leaf blight severity while maximum contribution of tester was obtained in case of days to 50 percent shedding, days to 50 percent silking, grain moisture and shelling percent. On the other hand the contribution of lines x testers for the total hybrid variance was found considerably high compare to male and female contribution for the trait plant height, ear height and grain yield.

For northern leaf blight severity contribution of the female parent was 40.74 per cent followed by male parent (30.96 %) then by L x T interaction (28.3 %) which showed that all the three components are contributing in the inheritance of the northern corn leaf blight.

KEY WORDS: Variance, Northern, Interaction and Severity.

I. INTRODUCTION

Maize is prone to as many as 112 diseases in different parts of the world, caused by fungi, bacteria, viruses and nematodes leading to extensive damage. In India, about 61 diseases have been reported to affect the crop. These include seedling blights, stalk rots, foliar diseases, downy mildews and ear rots (Payak and Renfro, 1968 and Payak and Sharma, 1985). Among the several diseases, Turcicum leaf blight (TLB) or Northern corn leaf blight (NLB) is one of the major fungal diseases of corn. Northern corn leaf blight causes due to fungus *Exserohilum turcicum* (Pass.) Leonard and Suggs. The early symptoms of the disease are oval, water-soaked spots on leaves and the later diseased stage shows characteristic cigar shaped lesions that are 3 to 15 cm long. These elliptical, long cigar-shaped gray-green or tan color lesions develop into distinct dark areas as they mature and become associated with fungal sporulation. Lesions typically first appear on lower leaves, spreading to upper leaves and the ear sheaths as the crop matures. Under severe infection, lesions may coalesce, blighting the entire leaf. NLB affects the photosynthesis with severe reduction in yield to an extent of 28 - 91 percent (Robert, 1953).

A. Materials and Methods

The material for the experiment comprised of 13 parents (Table 2) and 36 F_1's (Table 1) developed during the kharif 2016 at the Maize research farm, Metahelix life sciences ltd, Phulambri. During *Kharif*2017, six generation trial was planted of which the part of the non-segregating generations that is parents and F_1's (Table 2 &3) was considered for the Line x Tester experiment.

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Table 1: Maize inbred lines used to understand the genetics of northern corn leaf blight through generation mean analysis

Sr No	Inbred Line	Status of disease Reaction	Source	Use In crossing Block as
1	MRI1	Susceptible	Metahelix Life Sci. ltd	Female
2	MRI2	Susceptible	Metahelix Life Sci. ltd	Female
3	MRI3	Susceptible	Metahelix Life Sci. ltd	Female
4	MRI4	Moderate Resistnat	Metahelix Life Sci. ltd	Female
5	MRI5	Moderate Resistant	Metahelix Life Sci. ltd	Female
6	MRI6	Moderate Resistant	Metahelix Life Sci. ltd	Female
7	MRI7	Resistant	Metahelix Life Sci. ltd	Female
8	MRI8	Resistant	Metahelix Life Sci. ltd	Female
9	MRI9	Resistant	Metahelix Life Sci. ltd	Female
10	MRT1	Susceptible	Metahelix Life Sci. ltd	Male
11	MRT2	Susceptible	Metahelix Life Sci. ltd	Male
12	MRT3	Resistant	Metahelix Life Sci. ltd	Male
13	MRT4	Resistant	Metahelix Life Sci. ltd	Male

Table 2: List of F_1's and F_2's evaluated in trial

F_1 crosses (Hybrid)			F_2 population		
1	F_1	MRI1 X MRT1	1	F_2	MRI1 X MRT1)@
2	F_1	MRI2 X MRT1	2	F_2	MRI2 X MRT1)@
3	F_1	MRI3 X MRT1	3	F_2	MRI3 X MRT1)@
4	F_1	MRI4 X MRT1	4	F_2	MRI4 X MRT1)@
5	F_1	MRI5 X MRT1	5	F_2	MRI5 X MRT1)@
6	F_1	MRI6 X MRT1	6	F_2	MRI6 X MRT1)@
7	F_1	MRI7 X MRT1	7	F_2	MRI7 X MRT1)@
8	F_1	MRI8 X MRT1	8	F_2	MRI8 X MRT1)@
9	F_1	MRI9 X MRT1	9	F_2	MRI9 X MRT1)@
10	F_1	MRI1 X MRT2	10	F_2	MRI1 X MRT2)@
11	F_1	MRI2 X MRT2	11	F_2	MRI2 X MRT2)@
12	F_1	MRI3 X MRT2	12	F_2	MRI3 X MRT2)@
13	F_1	MRI4 X MRT2	13	F_2	MRI4 X MRT2)@

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14	F_1	MRI5 X MRT2	14	F_2	MRI5 X MRT2)@
15	F_1	MRI6 X MRT2	15	F_2	MRI6 X MRT2)@
16	F_1	MRI7 X MRT2	16	F_2	MRI7 X MRT2)@
17	F_1	MRI8 X MRT2	17	F_2	MRI8 X MRT2)@
18	F_1	MRI9 X MRT2	18	F_2	MRI9 X MRT2)@
19	F_1	MRI1 X MRT3	19	F_2	MRI1 X MRT3)@
20	F_1	MRI2 X MRT3	20	F_2	MRI2 X MRT3)@
21	F_1	MRI3 X MRT3	21	F_2	MRI3 X MRT3)@
22	F_1	MRI4 X MRT3	22	F_2	MRI4 X MRT3)@
23	F_1	MRI5 X MRT3	23	F_2	MRI5 X MRT3)@
24	F_1	MRI6 X MRT3	24	F_2	MRI6 X MRT3)@
25	F_1	MRI7 X MRT3	25	F_2	MRI7 X MRT3)@
26	F_1	MRI8 X MRT3	26	F_2	MRI8 X MRT3)@
27	F_1	MRI9 X MRT3	27	F_2	MRI9 X MRT3)@
28	F_1	MRI1 X MRT4	28	F_2	MRI1 X MRT4)@
29	F_1	MRI2 X MRT4	29	F_2	MRI2 X MRT4)@
30	F_1	MRI3 X MRT4	30	F_2	MRI3 X MRT4)@
31	F_1	MRI4 X MRT4	31	F_2	MRI4 X MRT4)@
32	F_1	MRI5 X MRT4	32	F_2	MRI5 X MRT4)@
33	F_1	MRI6 X MRT4	33	F_2	MRI6 X MRT4)@
34	F_1	MRI7 X MRT4	34	F_2	MRI7 X MRT4)@
35	F_1	MRI8 X MRT4	35	F_2	MRI8 X MRT4)@
36	F_1	MRI9 X MRT4	36	F_2	MRI9 X MRT4)@

B. Scheme of the experiment

The summery of experimental lay out is given below.

1. Experimental design : RBD
2. Number of replications : 2
3. No of genotypes : 49 (36 F_1 and 13 Parents)
4. Row length : 4 m
5. Number of rows per plot : 2

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6. Spacing between rows : 60 cm

7. Spacing between plants within row : 30 cm

C. Recording of Observations

Days to 50 per cent shedding
Recorded the number of days from planting to the date when 50% of the plants in a plot had tassel shedding.
Days to 50 per cent silking
Recorded the number of days from planting to date when 50% of the plants in a plot have emerged silk.
Plant height
The height of plant was measured from the ground to the tip of tassel in centimeters
Ear height (cm)
It was measured from the ground to the base of highest developed ear in centimeters.

Grain moisture per cent
The grain moisture content in harvested grain was measured by a moisture meter in percent.

Shelling per cent
It was computed using formula. Shelling percentage = Weight of shelled grain/Total weight of de husked ears x 100
Grain yield kg per hectare
It is determine by shelling and taking the grain weight of all ears harvested from each plot Grain yield (at 15% moisture)
Northern leaf blight severity
Disease Damage score was recorded in 1-9 scale. (as described in 3.2.2.3)
Statistical Analysis
The treatment means of selected plants were used for further statistical analysis. The data were subjected to following statistical analysis.

III. RESULTS AND DISCUSSION

In this study it was observed that contribution of the lines towards total hybrid variance was found to be higher for northern corn leaf blight severity while maximum contribution of tester was obtained in case of days to 50 percent shedding, days to 50 percent silking, grain moisture and shelling percent. On the other hand the contribution of lines x testers for the total hybrid variance was found considerably high compare to male and female contribution for the trait plant height, ear height and grain yield.

For northern leaf blight severity contribution of the female parent was 40.74 per cent followed by male parent (30.96 %) then by L x T interaction (28.3 %) which showed that all the three components are contributing in the inheritance of the northern corn leaf blight. Proportion of contribution of lines, testers and their interaction to total hybrid variance for the studied traits were presented in Table 3 and Fig. 1. Meseka *et al.*,(2006) also evaluated the performance of twenty four maize inbred lines using line x tester analysis method for traits such as days to silking, days to anthesis, plant and ear height, grain yield and ears per plant and found that significant GCA due to lines and testes and significant line x tester interaction for most studied traits. Similarly, Makumbi *et al.* (2005) evaluate the yield potential of nineteen synthetic maize varieties under stress and non-stress conditions using this analysis method. They found significant differences between synthetic hybrids and parental synthetics for grain yield and days to anthesis. Shanthi *et al.* (2002) studied the nature of gene action and combining ability for crop yield, oil and protein contents in maize lines developed through line x tester design.

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Table 3: Proportion of contribution of lines, testers and their interaction to total hybrid variance

Sr. No	Trait	Contribution of lines (%)	Contribution of testers (%)	Contribution of L x T (%)
1	Days to 50 percent shedding	26.1	40.76	33.14
2	Days To 50 percent Silking	28.25	37.5	34.25
3	Plant Height (cm)	11.37	10.02	78.61
4	Ear Height (cm)	31.59	1.1	67.3
5	Grain Moisture percent	5.52	58.65	35.82
6	Shelling percent	22.34	52.61	25.05
7	Grain Yield (Kg/ha)	31.94	19.28	48.78
8	NLB severity	40.74	30.96	28.3

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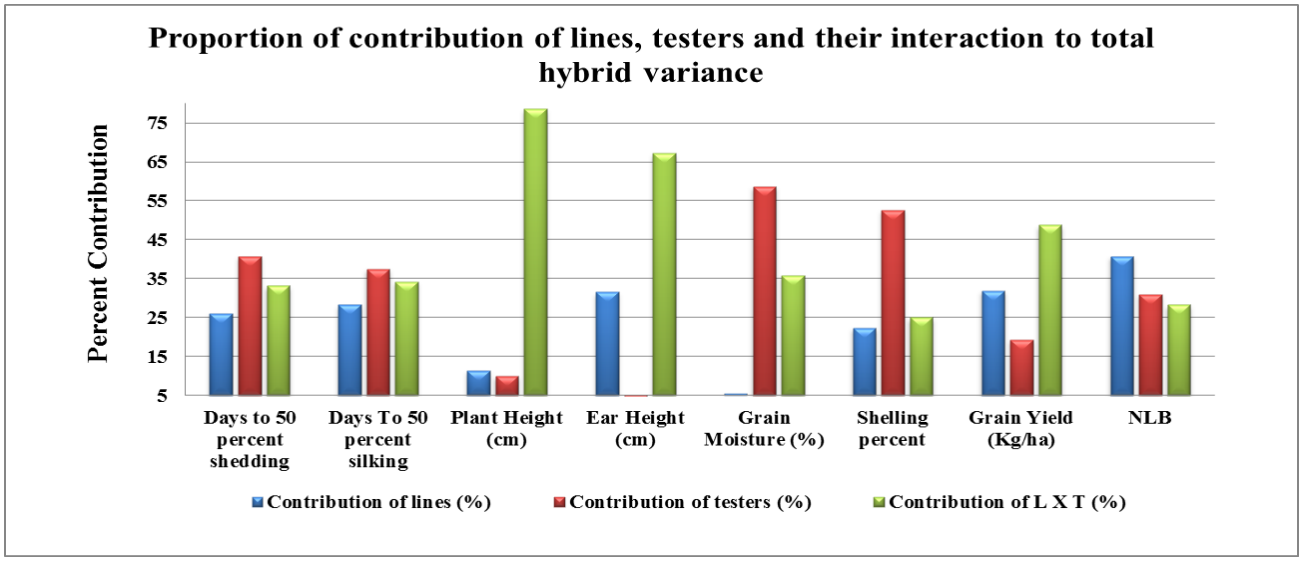

IV. CONCLUSION

It was conclud that contribution of the lines towards total hybrid variance was found to be higher for northern corn leaf blight severity while maximum contribution of tester was obtained in case of days to 50 percent shedding, days to 50 percent silking, grain moisture and shelling percent. On the other hand the contribution of lines x testers for the total hybrid variance was found considerably high compare to male and female contribution for the trait plant height, ear height and grain yield.

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