EFFECT OF HOST NUTRITION ON THE SEVERITY OF RUST AND LEAF BLIGHT ON MAIZE

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ABSTRACT

Effect of pig litter (PL) in combination with nitrogen (urea) on the severity of rust and leaf blight was studied in maize (Zea Mays L.) cv. RCM 1-1. Among the 16 treatment combinations minimum (4.43%) and maximum (9.60%) rust index were recorded in treatment where the maize crop was applied with 0 t PL+ 0kg N/ha and 30 t PL + 90 kg N/ha respectively and as the dose of PL and nitrogen increased the rust intensity also increased. Effect of PL and nitrogen had negative impact on the development of leaf blight. Leaf blight was recorded minimum (19.31%) and maximum (31.86%) in plots treated with 0 t PL + 0 kg N/ha and 45 t PL + 90 kg N/ha respectively. Increase doses of PL and nitrogen decreased the leaf blight disease index in both the seasons of 1998 and 1999. Highest grain yield of 33.82 q/ha was obtained in plots supplied with 45 t PL + 90 kg N/ha.

INTRODUCTION

Maize is the second most important crop of North Eastern Hill (NEH) Region covering an area 137.2 thousand hectares with an average productivity of 1265 kg/ha (Mahajan et al., 1996). There is a great potential of increasing maize productivity in NEH region. However, maize in the jhum (shifting cultivation) with little or without chemical fertilizers in a limiting factor of increasing productivity in this region. Besides incidence of diseases like leaf blights *(Helminthosporium turcicum)* at higher altitude and Helminthosporium maydis at lower altitude (Anon.1977) and maize rust (Puccinia sorghi) at medium altitude (Ann., 1978) are other limiting factors in achieving the goal of higher production. The farmers used to use locally available low cost manures such as cow dung or pig litter sometimes as sole nutrition to the rainfed maize crop grown mainly in jhum or home yard land. Nutrition has a great role on the development of disease but no information on the effect of PL and nitrogen on the severity of rust and leaf blight of maize is available. Therefore, in the present investigation, an attempt was made to study the effect of locally available low cost PL in combination with chemical nitrogen fertilizer on the severity of rust and leaf blight on maize cv. RCM 1-1.

MATERIALS AND METHODS

Maize (cv. RCM 1-1) was sown in randomized block design with 3 replications at the experimental farm of ICAR Research complex for NEH Region, Arunachal Pradesh Centre, Basar (27°95' N latitude and 94°7' E longitude at an altitude of 660m MSL), during the kharif

season of 1998 and 1999 under rainfed conditions. The maize was sown at a spacing of 60 cm X 20 cm in 8 sq. m. plots. Sixteen treatment combinations of pig litter (PL) and nitrogen were applied. The treatments were as follows:

T1 = 0tPL + 0 kg N/ ha	T9 = 30 tPL + 0 kg N /ha
T2 = 0tPL + 30 kg N/ ha	T10 = 30 tPL + 30 kg N /ha
T3 = 0tPL + 60 kg N /ha	T11 = 30 tPL + 60 kg N /ha
T4 = 0tPL + 90 kg N/ ha	T12 = 30 tPL + 90 kg N /ha
T5 = 0tPL + 0 kg N /ha	T13 = 30 tPL + 0 kg N /ha
T6 = 0tPL + 30 kg N/ ha	T14 = 30 tPL + 30 kg N /ha
T7 = 0tPL + 60 kg N /ha	T15 = 30 tPL + 60 kg N /ha
T8 = 0tPL + 90 kg N /ha	T16 = 30 tPL + 90 kg N /ha

In all the plots pig litter (PL) was applied as basal dose at the time of sowing but nitrogen was applied in two split doses, one at the time of sowing and another dose at 50 days after sowing (DAS) in the form of urea. Rust and leaf blight appeared on the crop under natural condition in May-June. Disease severity was recorded on 10 randomly selected plants on 0–9scales following Mayee and Datar (1986) for each plot at 15 days interval up to 20 days before harvest. Percent Disease Index (PDI) was calculated for each treatment following the formula:

$$PDI = \frac{\text{Sum of all class rating}}{\text{Number of leaves examined X maximum score}} \times 100$$

RESULTS AND DISCUSSION

Rust

The mean rust index was maximum (9.60%) at 30 t PL + 90 Kg N/ha whereas it was minimum (4.43%) in control. Rust index increased to 6.30, 6.84 and 7.10% in T2, T3 and T4 with the increase nitrogen dose @ 30, 60 and 60 Kg N/ha. Similarly, mean rust index was less in T5 (5.77%) where PL @ 15 t/ha only was applied but the same increased to 7.22, 7.60 and 7.9% in T6, T7 and T8 with the increase dose of nitrogen @ 30, 60, 90 kg N/ha in combination with 15t PL/ha respectively. Again mean rust index were less in T9 (5.46%) and T13 (7.54%) but the disease index rose with higher dose of nitrogen. As such mean rust index was less in T1, T5, T9 and T13 with respect to other treatment combinations but it followed rust index in T13 > T5 > T9> T1, indicating PL had a definite role in rust intensity in maize variety RCM 1-1. Nevertheless, as the dose of nitrogen increased, the rust intensity increased in rest of the treatments also in both the years

Leaf blight

Leaf blight responded reversly to the host nutrition. Poor host nutrition with PL and nitrogen had resulted higher leaf blight index (LBI) whereas luxurious application of the same brought down the LBI. LBI was maximum (31.86%) in T1, where no PL and nitrogen was applied but it was minimum (19.31%) in T16 when the maize crop was fed 45t PL/ha in

addition to 90 kg N/ha. Among TI, T2, T3 and T4 treatment combination of PL and nitrogen, lowest leaf blight index was recorded in T4 (20.67%) where no PL and 90 kg N/ha was applied but the disease index gradually increased (PDI= 24.74, 31.42 and 31.86%) in T3, T2, T, with the decrease rate of host nutrition (i.e. 0tPL + 60 kg N/ha-1, 0tPL + 30 kg N/ha and 0t PL + 0 kg N/ha) respectively. Further, amongst T5, T6, T7 and T8 treatments lowest disease index was observed in T8 (26.08%) where 15tPL + 90 kg N/ha was applied. Other treatments with higher dose of PL and nitrogen a showed lower intensity of leaf blight. Among TI, T5, Tg and T13 highest degree of leaf blight index was observed in T, (31.86%) where no PL and nitrogen was applied but the same gradually decreased (i.e. 27.73, 27.25 and 25.29%) with the application of increased rate of PL @ 15, 30 and 45t/ha in T5, T9 and T13 respectively. Thus gradual decrease in PDI was observed with the increase in doses of PL and nitrogen in both the seasons of 1998 and 1999. Higher doses of PL and nitrogen played an important role in the maintenance of better plant health of maize crop, thus helped in fighting back against the development of leaf blight. The present findings corroborated the findings of Singh (1998) who reported that leaf blight became serious under poor management (under low nitrogen and water stress) condition. Chaudhary et al. (1983) also reported that higher dose of N and K in combination could reduce the leaf blight.

Grain yield

Maize grain yield was lowest in T1, (8.49q/ha) where no PL and nitrogen was applied. Although rust index was less in T1 leaf blight was highest and thus reduced the grain yield. On the contrary highest grain yield was obtained in T16 (33.82 q/ha), which was nutritioned with 45tPL + 90KgN/ha with lowest leaf blight severity although rust was comparatively high. It did not significantly affect the crop health and yield. Maize yield was at par in T10 (29.95q/ha), T11 (33.61q/ha), T14 (32.59 q/ha) and T15 (31.82q/ha) which were given nutrition @ 30tPL + 30 kg N/ha, 30tPL + 60 kg N/ha, 45tPL + 30 kgN/ha and 45tPL + 60 kgN/ha respectively. In these treatment combinations, rust did not significantly affect the plant health and mean leaf blight severity was comparatively less (25.99, 23.47, 22.17 and 24.47% respectively). Hence the yield was not affected seriously. Yield was not satisfactory in other treatments as the rust and leaf blight severity was more which in turn reduced the yield.

Thus the present investigation conclusively shows that higher dose of PL in combination with fertilizer nitrogen (urea) increased rust and decreased leaf blight severity in maize cv. RCM 1-1, whereas the maxmum grain yield was obtained with 45tPL + 90 kg N/ha.

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Table 1. Effect of integrated host nutrition on the severity of rust and leaf blight on maize cv. RCM 1-1

Treatment	PDI (Percent Disease Index, 0-9 scale)						Maize grain yield (q/ha)		
	Rust			Leaf Blight					
	1998	1999	Mean	1998	1999	Mean	1998	1999	Mean
T1	4.12(11.68)	4.74(12.52)	4.43(12.11)	30.44(33.46)	33.27(35.24)	31.86(34.39)	06.19	10.80	08.49
T2	5.80(13.94)	6.79(15.12)	6.30(14.54)	36.31(30.85)	26.53(30.98)	31.42(34.08)	10.66	19.8.	15.25
T3	6.69(15.00)	6.99(15.34)	6.84(15.12)	24.90(29.03)	24.67(29.80)	24.74(29.80)	15.36	24.50	19.93
T4	6.33(14.54)	7.89(16.32)	7.10(15.45)	20.55(26.99)	20.78(27.13)	20.67(27.06)	15.37	27.40	21.39
T5	4.34(11.970)	7.20(15.56)	5.77(13.94)	28.6(32.20)	27.51(31.63)	27.73(31.76)	13.04	19.60	16.32
T6	6.88(15.23)	7.56(16.00)	7.22(15.56)	29.81(33.09)	25.40(30.26)	27.61(31.69)	17.49	25.53	21.51
T7	6.41(14.650)	8.79(17.26)	7.60(16.00)	29.63(32.96)	23.84(29.20)	26.74(31.11)	20.06	28.86	24.46
T8	8.33(16.74)	7.64(16.00)	7.99(16.43)	28.04(31.95)	24.12(29.40)	29.08(30.72)	25.02	21.87	28.45
T9	5.42(13.44)	5.49(13.56)	5.46(13.56)	26.03(30.66)	28.47(32.27)	27.25(31.50)	20.09	33.00	26.55
T10	7.29(15.68)	7.54(17.79)	7.42(15.79)	26.12(30.72)	25.87(30.59)	25.99(30.66)	22.54	37.36	29.95
T11	8.71(17.16)	6.43(14.64)	7.57(16.00)	21.45(27.63)	25.48(30.33)	23.47(29.00)	30.44	36.77	33.61
T12	8.69(17.14)	10.51(18.91)	9.60(18.05)	21.99(27.97)	20.37(26.85)	21.18(27.35)	25.74	29.97	27.86
T13	8.85(17.36)	6.22(14.22)	7.54(15.89)	19.98(26.56)	30.59(33.58)	25.29(30.20)	22.92	32.07	27.49
T14	6.59(14.89)	7.99(16.43)	7.28(15.68)	20.95(27.28)	23.38(28.93)	22.17(28.11)	29.94	35.23	32.59
T15	6.48(14.77)	8.52(16.95)	7.50(15.89)	23.68(29.13)	25.25(30.20)	24.47(29.67)	29.01	34.63	31.82
T16	7.04(15.34)	8.86(17.36)	7.95(16.43)	17.11(24.43)	21.51(27.63)	19.31(26.06)	31.77	35.87	33.82
CD (P= 0.05)	NS	Ns	Ns	4.41	2.16	2.15	2.58	-	-
SE	1.80	1.38	-	5.61	-	-	1.05	1.27	-

Data in parentheses are angular transformation values.