

Impact of Individual Weed Species on Growth and Yield of Winter Maize in Central Plain Zone of Uttar Pradesh

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The crop diversification involving maize in place of wheat during winter has been found an effective approach in minimizing weed competition especially *Phalaris minor*—a grassy weed and to realize higher productivity and profitability under assured irrigation. Small and marginal farmers have reposed their choice towards winter maize cultivation to get immediate cash return by selling cobs and also who do not intend to invest more on herbicides to control *P. minor* and *Chenopodium album* during inter-culture. The heavy application of fertilizer coupled with frequent irrigation favours the growth of many grassy and broad-leaved weeds in this crop. It has been established that all the weed species are not equally competitive. The magnitude of crop yield losses depends mainly upon the nature and intensity of associated weed flora. The present investigation was aimed at quantifying the effect of individual weed flora on growth and yield of maize during winter.

The field experiment was conducted during consecutive years of 2005-06 and 2006-07 at Students' Instructional Farm of Chandra Shekhar Azad University of Agriculture and Technology, Kanpur. The soil was sandy loam in texture consisting of 0.34% organic carbon, 5.0 kg available P₂O₅, 181.0 kg /ha available K₂O with pH 8.0 and salinity 0.38 mhos/cm. The experiment was laid out in randomized block design with four replications. There were eight treatments viz., *Chenopodium album*, *Convolvulus arvensis*, *Anagallis arvensis*, *Melilotus alba*, *Phalaris minor* only, *Parthenium hysterophorus* only, weedy (all weeds) and weed free. Winter maize variety Sharad mani was sown at 50 cm row spacing, providing recommended dose of fertilizer (150 kg N, 60 kg P₂O₅ and 60 kg K₂O) irrigated seven times including pre- sowing irrigation. The desired type of weed species as per treatments was maintained manually by removing others, as and when required. Weed samples were collected at 45, 90 days after sowing (DAS) and at harvest stage for recording weed density and dry weight. The data were analyzed in randomized block design.

The experimental crop was heavily infested with different weed species dominated by *C. album*, *P. minor* and *P. hysterophorus*. *P. hysterophorus* and *C. album* infested plots exhibited maximum population (97.5 and 80.19/m²), while lowest population was recorded under *M. alba* plots (26.3/m²). The dry matter accumulation capacity was found maximum under *P. minor* plots (361.94 g/m²) followed by *C. album* (185.0 g/m²) and lowest (85.12 g/m²) under *C. arvensis* plots (Table 1).

The effect of individual weed species treatments was found significant on crop growth, while *P. minor* and *C. album* exerted maximum impact, *M. alba*, *C. arvensis* and *A. arvensis* species showed less impact on growth of maize (Table 2).

The adverse effect of weed was also reflected on yield attributes of maize viz., number of cobs/plant, cob length (cm), grain rows/cob, number of grains/row, weight of cob (g), grain weight (g)/cob, and 100-grain weight. The maximum deceleration of yield attributes was observed under *P. minor* and *C. album* infested plot. This could be due to competitive effect of these species for nutrients. The allelopathic effect could also hinder the grain formation.

The weed species significantly lowered the biological yield, grain and stover yield also. Results depicted that mix flora of all weeds registered 50.39% curtailment in grain yield. Among individual weed species, *P. minor* and *C. album* offered maximum competition and caused 44.21 and 39.45% reduction in grain yield, respectively. The other weeds viz. *P. hysterophorus*, *M. alba*, *C. arvensis* and *A. arvensis* offered less competition and reduced yield of maize by 19 to 24%.

The censorious impact of weed species has also reflected on values of weed index. The maximum weed index was visualized in case of *P. minor* (44.21%) infestation, while lowest was seen under *P. hysterophorus* infested plot (19.89%). While the competitive effects of some of the weeds in maize have been reported to cause yield loss by Hejazi *et al.* (2001) and Dogan *et al.* (2004).

Table 1. Weed population and weed dry weight at different stages in winter maize

Treatments	Weed population/m ²			Weed dry weight (g)/m ²		
	45 DAS	90 DAS	At harvest	45 DAS	90 DAS	At harvest
<i>C. album</i>	66.82 (8.19)	78.50 (8.81)	80.19 (8.96)	30.87 (5.57)	171.31 (13.11)	185.00 (13.62)
<i>C. arvensis</i>	6.51 (2.63)	23.58 (5.02)	31.19 (5.63)	5.37 (2.41)	46.31 (6.84)	85.12 (9.25)
<i>A. arvensis</i>	27.51 (5.21)	49.38 (7.04)	48.31 (6.97)	11.94 (3.49)	71.19 (8.47)	90.19 (9.52)
<i>M. alba</i>	8.69 (3.01)	24.25 (4.97)	26.37 (5.18)	5.94 (2.53)	44.56 (6.96)	107.44 (10.39)
<i>P. minor</i>	34.13 (5.71)	55.88 (7.16)	52.81 (7.17)	15.06 (3.91)	309.56 (17.61)	361.94 (19.03)
<i>P. hysterophorus</i>	21.94 (3.68)	94.38 (9.74)	97.50 (9.89)	3.25 (1.68)	55.87 (7.12)	175.37 (13.24)
Weedy	108.88 (10.43)	155.06 (12.47)	158.00 (12.58)	94.31 (6.67)	346.69 (18.62)	390.87 (19.77)
Weed free	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)	0.00 (0.71)
LSD (P=0.05)	0.22	0.17	0.16	0.14	0.27	0.08

Data in parentheses after square root transformation.

Table 2. Effect of individual weed species on growth characters, yield attributes and yield of winter maize

Treatments	Growth characters				Yield Attributes						Yield				
	Plant height (cm)	Girth of plant (cm)	Leaf area (cm ²)	Dry weight of plant (g)	No. of cobs/ plant	Cob length (cm)	Grain rows/ cob	No. of grains/ row	Weight of cob (g)	Grain weight (g)/cob	100- grain weight (g)	Biological yield (q/ha)	Grain yield (q/ha)	Stover yield (q/ha)	Weed index (%)
<i>C. album</i>	173.83	5.80	3361.13	173.98	1.04	11.33	13.16	24.26	69.18	56.98	18.86	74.56	34.22	40.34	39.46
<i>C. arvensis</i>	210.14	7.12	4939.41	235.56	1.21	12.69	13.97	25.50	85.62	73.54	20.71	90.46	42.13	48.34	23.92
<i>A. arvensis</i>	206.22	7.16	4742.53	232.47	1.21	12.97	14.11	26.56	91.01	76.53	20.78	92.81	42.70	50.11	24.45
<i>M. alba</i>	207.81	7.32	5031.83	234.64	1.37	12.94	13.96	26.62	89.73	77.87	20.89	95.45	43.50	52.02	23.04
<i>P. minor</i>	171.80	5.76	3328.81	126.21	1.04	10.72	13.29	23.60	57.36	49.04	18.01	70.14	31.53	38.61	44.21
<i>P. hysterophorus</i>	196.19	6.43	4305.59	209.44	1.21	11.68	13.79	25.88	86.80	74.69	20.84	96.25	45.28	50.97	19.89
Weedy	169.09	5.45	2993.83	107.99	1.04	10.10	12.34	21.63	50.67	41.92	16.96	62.41	28.04	34.38	50.32
Weed free	220.94	7.81	5783.87	277.63	1.54	13.96	14.80	30.70	106.12	94.47	22.73	118.12	56.52	61.60	0.00
LSD (P=0.05)	3.12	0.21	531.87	4.70	0.24	1.14	0.99	1.43	2.99	3.69	0.55	2.24	1.73	0.48	-

REFERENCES

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