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Residual effect of weed management and phosphorus applied to Indian mustard (*Brassica juncea*) on succeeding fodder maize (*Zea mays*)

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ABSTRACT

An investigation was carried out during 1998–99 and 1999–2000 at Udaipur, to study the residual effect of weed management and phosphorus treatments applied to previous crop of Indian mustard [*Brassica juncea* (L.) Czernj. & Cosson] on fodder maize (*Zea mays* L.) and weeds in summer season. Fodder yield of maize was significantly increased during 1999–2000 owing to residual effect of different weed-management treatments. Similarly, residual effect of phosphorus fertilization significantly increased the value of growth parameters and fodder yield of maize as well as weed dry matter during both the years. The mean increase was 8.30% in fodder yield owing to residual response of phosphorus at 40 kg P_2O_5/ha over the control.

Key words : Residual effect, Weed management, Phosphorus, Fodder maize

Because of increased cost of hand weeding, herbicides no doubt offer a great scope in minimizing the cost of weed control. But the residual problem due to the application of herbicides poses a threat towards wide-spread use of herbicides and limits the choice of herbicides to be chosen in a crop rotation. The residual activity of a herbicide would be an important consideration of its use in arable farming (Bainade, 1998). A considerable portion of applied P remains in the soil after crop harvest (Patrick and Reddy, 1976). In a cropping sequence, first crop hardly utilizes 10–20% of the applied phosphorus and the rest remains in soil for the subsequent crops. An attempt was made to study the residual effect of different weed management and phosphorus treatments applied to the previous crop of Indian mustard on summer fodder maize, as such effect has not been studied in vertisols of south-eastern region of Rajasthan.

MATERIALS AND METHODS

A field experiment was conducted at

Agronomy Research Farm of Rajasthan College of Agriculture, Udaipur, during 1998–99 and 1999–2000 on clay-loam soil. The soil was medium in available N and P and high in K content. Fodder maize was sown in the summer season after the harvest of Indian mustard. The treatments applied to Indian mustard comprised 6 weed-management practices (weedy check, hand-weeding at 30 days after sowing, Fluchloralin 1.0 kg/ha pre-plant incorporation, Pendimethalin 0.75 kg/ha, Alachlor 1.5 kg/ha and Oxyfluorfen 0.125 kg/ha pre-emergence) and 4 levels of phosphorus (0, 20, 40 and 60 kg P_2O_5/ha). The experiment was laid out in factorial randomized block design with 4 replications.

The seeds @ 45 kg/ha of 'G 2' maize were sown in rows 30 cm apart for fodder purpose. Recommended dose of 80 kg N/ha was applied to fodder maize through urea in 2 equal splits, at sowing and knee-high stage of crop. Irrigation was applied as per requirement of the crop. After carrying out weed study 30 days after sowing of crop, hand-weeding was performed to remove all the weeds from all the plots. The crop was harvested at tasselling stage during both the years.

RESULTS AND DISCUSSION

Direct effect on Indian mustard

All the weed-management practices significantly increased the seed yield of Indian mustard over the control (Table 1). The highest seed yield of Indian mustard was recorded under the treatment Oxyfluorfen, closely followed by Pendimethalin. The corresponding increase in mean seed yield of Indian mustard owing to Oxyfluorfen was 80.12% over the control (11.42 q/ha). The results confirm those of Kaneria and Patel (1995).

A significant improvement in seed yield of Indian mustard was noted with the increase in P application up to 40 kg P_2O_5/ha (Table 1). Mean seed yield increased by 14.7 and 40.3% owing to application of 20 and 40 kg P_2O_5/ha, respectively , over the control (14.29 q/ha).

Residual effect on fodder maize

Dry-matter accumulation at early stage (30 days stage) and plant height of fodder maize did not differ due to residual effect of different weed-management practices. But the fodder yield was positively influenced by residual effect of these practices over the control during the second year. Though increasing trend in fodder yield was also noted during the first year, it did not reach at significant level (Table 2). The increase in fodder yield may be due to efficient control of weeds in preceding Indian mustard crop that would have minimized the competition for essential inputs, resulting in better crop growth. Weed control might have saved a substantial amount of nutrients which resulted in improved productivity of the following fodder maize crop. The findings are in agreement with those of Ahlawat and Singh (1991) and Patel and Saraf (1991).

Phosphorus residues left over in the soil after Indian mustard significantly increased the dry-matter accumulation at 30-day stage during both the years and plant height at harvest during the second year (Table 2). Further, residual effect of 40 kg P_2O_5/ha significantly increased the fodder yield of

Table 1. Direct effect of weed management and P levels on seed yield of Indian mustard and their residuals effect on growth and yield of succeeding fodder maize

Treatment	Succeeding fodder maize									
	Mustard seed yield (q/ha)			Dry-matter accumulation (g/plant) at 30 DAS		Plant height (cm) at harvest		Green-fodder yield (q/ha)		Mean
	1998–99	1999–2000	Mean	1998–99	1999–2000	1998–99	1999–2000	1998–99	1999–2000	
Weed management										
Weedy check	11.86	10.97	11.42	10.63	10.84	173	175	362.48	378.72	370.60
Hand-weeding once	19.49	18.52	19.01	11.18	11.26	175	178	394.88	413.68	404.28
Fluchloralin 1.0 kg/ha	18.76	17.32	18.04	11.14	11.20	174	178	386.28	408.11	397.20
Pendimethalin 0.75 kg/ha	20.21	19.38	19.80	11.02	11.21	176	178	383.10	412.24	397.67
Alachlor 1.5 kg/ha	18.11	17.03	17.57	11.20	11.14	176	180	395.22	402.03	398.63
Oxyfluorfen 0.125 kg/ha	21.04	20.10	20.57	11.16	11.28	176	180	390.74	416.15	403.45
CD (P=0.05)	1.35	1.32	-	NS	NS	NS	NS	NS	23.26	-
P (kg P_2O_5/ha)										
0	14.82	13.76	14.29	10.58	10.70	171	172	366.52	386.23	376.58
20	16.93	15.85	16.39	10.90	11.05	174	175	376.08	395.15	385.62
40	20.57	19.53	20.05	11.31	11.38	176	182	398.02	417.68	407.85
60	20.66	19.74	20.20	11.43	11.49	178	184	401.18	421.16	411.17
CD (P=0.05)	1.11	1.07	-	0.63	0.43	NS	9	21.86	18.99	-

Table 2. Residual effect of weed management and phosphorus levels applied to Indian mustard crop on density and dry matter of weeds in fodder maize

Treatment	Weed density (No./m²)		Weed dry matter (kg/ha)	
	1998–199	1999–2000	1998–199	1999–2000
Weed management				
Weedy check	77	75	127.8	121.8
Hand-weeding once	79	75	128.3	121.3
Fluchlaralin 1.0 kg/ha	77	73	128.9	123.0
Pendimethalin 0.75 kg/ha	77	76	129.1	122.6
Alachlor 1.5 kg/ha	78	74	127.4	122.9
Oxyfluorfen 0.125 kg/ha	77	75	128.8	122.9
CD (P=0.05)	NS	NS	NS	NS
P (kg P_2O_5/ha)				
0	77	74	119.4	114.4
20	77	75	126.3	119.8
40	78	76	133.2	126.9
60	78	74	134.7	128.5
CD (P=0.05)	NS	NS	7.1	7.0

succeeding fodder maize crop during both the years over 0 and 20 kg P_2O_5/ha, but it was at par with 60 kg P_2O_5/ha. The increase in mean fodder yield owing to residual effect of 40 kg P_2O_5/ha (407.85 q/ha) was 8.30 and 5.76% over 0 and 20 P_2O_5/ha. The residual effect of phosphorus was probably due to solubilization of residual P as such due to high air or soil temperature as well as due to the role of organic acids produced as a by-product of decomposition or mineralization of organic compounds in soil, leading to better availability of phosphorus for plants and therefore having a profound effect on growth and yield (Suri and Puri, 1997).

Residual effect on weeds

Weed-control methods adopted for Indian mustard did not significantly alter the weed density as well as weed dry matter at 30-day stage in succeeding fodder maize crop (Table 2). It may be due to the fact that the herbicides applied in Indian mustard crop to control the weeds did not leave adverse level of their residues in the experimental field.

Phosphorus nutrition applied in preceding crop had no significant effect on weed density in fodder maize crop. However, weed dry matter was favourably influenced owing to residual effect of 40 and 60 kg P_2O_5/ha.

REFERENCES

Ahlawat, I.P.S. and Singh, A. 1991. Effect of phosphorus and weed control on chickpea (*Cicer arietinum*) and after effects on productivity and nitrogen economy in succeeding maize (*Zea mays* L.). *Indian Journal of Agronomy* **36** (3) : 33–36.

Bainade, S.S. 1988. 'Effect of weed control methods and nitrogen levels on wheat and their residual effect on succeeding summer greengram crop'. Ph.D. Thesis, Gujarat Agricultural University, Sardar Krushinagar.

Hiltbold, A.E. 1974. Persistence of pesticides in soil. *(In) : Pesticides in Soils and Water,* pp. 203–522. Guenzi, W.D. Soil Science Society of America, Madison, Wisconsin.

Kaneria, B.B. and Patel, Z.G. 1995. Integrated weed management and nitrogen in Indian mustard (*Brassica juncea*) and their residual effect on succeeding greengram (*Phaseolus radiatus*). *Indian Journal of Agronomy* **40**(3) : 444–449.

Patel, C.L. and Saraf, C.S. 1991. Residual effect of irrigation, phosphorus and weed control treatment applied to summer cowpea (*Vigna unguiculata*) on yield and nutrient uptake by fodder sorghum (*Sorghum bicolor*) and weeds in the rainy season. *Indian Journal of Agronomy* **36** (3) : 337–339.

Patrick, W.H. (Jr) and Reddy, R.K. 1976. Fate of nitrogen in a flooded rice soil. *Journal, Soil Science Society of America* **40** (5) : 678–681.

Suri, V.K. and Puri, U.K. 1997. Effect of phosphorus application with and without farmyard manure on rainfed maize (*Zea mays*)–wheat (*Triticum aestivum*)–maize sequence. *Indian Journal of Agricultural Sciences* **67**(1) : 13–15.