

Response of winter maize (*Zea mays*) to integrated weed management

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ABSTRACT

A field study was carried out for 2 years (winters of 1998–99 and 1999–2000) with 14 weed-management treatments at Pusa, to know the response of winter maize (*Zea mays* L.). Significantly higher grain yield of 89.80 q/ha (on the basis of maize-yield equivalence) was obtained with application of Alachlor 1.5 kg a.i./ha + French bean (*Phaseolus vulgaris* L.) as smother crop, followed by French bean only as smother crop (67.43 q/ha). Hand-weeding with 60.30 q/ha yield was at par with Atrazine 1.5 kg a.i./ha + 2,4-D 0.8 kg a.e./ha (56.20 q/ha) and Alachlor 1.5 kg a.i./ha + Atrazine 0.5 kg a.i./ha (53.50 q/ha).

Key words : Winter maize, Integrated weed management

Maize is one of the most important cereals of the world and has wide distribution and varied uses as food, feed and fodder. Bihar is the pioneer and important state growing winter (*rabi*) maize with higher productivity. During initial slow growth period of winter maize its wider spacing favours the growth of weeds and same can be checked by growing smother crop. As weeds reduce the yield of winter maize to a greater extent, an integrated weed management is very important to provide an effective and acceptable means of weed control for realizing high production and profit levels. Keeping in view the facts, present investigation was

carried out to assess the effect of integrated weed management on growth and yield of winter maize.

MATERIALS AND METHODS

The field experiment was conducted at the Research Farm of Rajendra Agricultural University, Pusa, Bihar, during the winter (*rabi*) seasons of 1998–99 and 1999–2000 in randomized block design with 14 treatments, replicated thrice. The treatments were: T₁, weedy check; T₂, weed-free check (hand-weeding twice 25 and 45 days after sowing; T₃, French bean as smother crop; T₄, Alachlor @ 1.5 kg a.i./ha (pre-em.); T₅, Alachlor @ 2.0 kg a.i./ha

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(pre-em.); T₆, Alachlor @ 2.5 kg a.i./ha (pre-em.); T₇, Alachlor 1.5 kg a.i./ha + French bean as smother crop; T₈, Atrazine 1.5 kg a.i./ha (pre-em.) + earthing up (45 days); T₉, Alachlor @ 1.5 kg a.i./ha (pre-em.) + earthing up (45 DAS); T₁₀, Atrazine @ 1.5 kg a.i./ha (pre-em.) + 2,4-D @ 0.8 kg a.i./ha (pre-em.); T₁₁, Alachlor @ 0.75 kg a.i./ha + Atrazine @ 0.5 kg a.i./ha (pre-em.); T₁₂, Alachlor @ 1.0 kg a.i./ha + Atrazine @ 0.5 kg a.i./ha (re-em.); T₁₃, Alachlor @ 1.25 kg a.i./ha + Atrazine @ 0.5 kg a.i./ha (pre-em.); and T₁₄, Alachlor @ 1.5 kg a.i./ha + Atrazine @ 0.5 kg a.i./ha (re-em.). The soil of the experimental plot was silt loam in texture and low in fertility status. A composite maize cultivar 'Dewaki' was sown with the spacing of 60 cm × 25 cm on 13 and 17 November in 1998 and 1999, respectively, and harvested in 29 April and 2 May in 1999 and 2000 respectively. A common fertilizer dose of 120, 75 and 50 kg/ha of N, P₂O₅ and K₂O was applied though of urea, diammonium phosphate and muriate of potash. Other agronomical package and practices were followed. Data on pre- and post-harvest plant parameters were collected and yield was recorded.

RESULTS AND DISCUSSION

Growth attributes

Growth attributes were significantly affected by integrated weed management. Maximum plant height was recorded in treatment pre-atrazine + post 2,4-D, while the minimum in weedy check (Table 1). Two hand-weedings resulted in higher leaf-area index, followed by Alachlor 1.5 kg a.i./ha + French bean (smother crop),

Atrazine 1.5 kg a.i./ha + 2,4-D 0.8 kg a.i./ha and Alachlor 1.5 kg a.i./ha + Atrazine 0.5 kg a.i./ha. Dry-matter accumulation was highest in 2 hand-weedings, followed by Alachlor 1.5 kg + French bean (smother crop) and both these were significantly superior to rest of the treatments. Crop-growth rate was also highest under hand-weeding twice. All these growth attributes were the lowest under weedy condition. This was due to severe weed competition. Under treated plots either through mechanical, cultural or chemical method of weed control reduced the weed growth as well nutrient drain and made congenial environment for the crop which in turns provided higher nutrient supply and better crop efficiency, resulting higher growth attributes. This result supports work of Sharma (1988) and Prasad *et al.*, (1990).

Yield attributes

Yield attributes of winter maize like length of cob, grains/cob and weight of grains/cob were affected significantly by integrated weed management. All these were highest in hand-weeding twice. Other cultural and chemical treatments also resulted in higher values and were at par with hand-weeding and significantly superior to weedy check. Higher values under treated plots were owing to favourable environment. Similar findings were also observed by Saha and Srivastava (1992).

Yields

The maximum maize-equivalence grain yield was observed with Alachlor 1.5 kg a.i./ha + French bean as smother crop (Table 1). The treatment with only French

Table 1. Effect of integrated weed management on growth, yield attributes and yield of winter maize (mean data of 2 years)

Treatment	Plant height (cm)	Leaf-area index	Dry-matter accumulation (g/plant)	Crop-growth rate at 90-120 days interval (g/day)	Length of cob (cm)	Grains/cob	Weight of grain/cob (g)	Grain yield (q/ha)	Stover yield (q/ha)
T ₁ (weedy check)	116.8	2.84	76.5	1.24	13.8	247.8	99.5	36.20	60.30
T ₂ (weed-free check)	170.5	3.55	97.6	1.95	16.9	353.7	132.9	60.30	75.26
T ₃ (French bean as smother crop)	163.4	3.41	82.7	1.65	14.8	308.1	114.7	67.43*	95.34*
T ₄ (Alachlor 1.5 kg a.i./ha)	152.2	3.44	86.0	1.69	15.5	314.8	111.3	45.28	68.50
T ₅ (Alachlor 2.0 kg a.i./ha)	158.2	3.44	86.0	1.69	15.0	321.7	120.2	48.35	71.62
T ₆ (Alachlor 2.5 kg a.i./ha)	160.8	3.48	87.5	1.83	15.1	333.6	122.3	49.40	72.53
T ₇ (Alachlor 1.5 kg a.i./ha) + French bean as smother crop	165.2	3.53	96.6	1.89	16.9	348.6	132.3	89.80*	126.64*
T ₈ (Atrazine 1.5)	168.1	3.32	88.4	1.67	15.6	339.3	126.0	51.60	71.08
T ₉ (Atrazine 1.5 + E.U. kg a.i./ha)	167.1	3.31	84.4	1.56	14.9	338.0	120.0	48.05	63.94
T ₁₀ (Atrazine 1.5+2,4-D 0.8 kg a.i./ha)	172.4	3.53	90.0	1.72	15.7	344.5	131.1	56.20	69.44
T ₁₁ (Alachlor 0.75+Atrazine 0.5 kg a.i./ha)	170.6	3.37	84.3	1.58	14.9	319.1	117.2	47.50	65.82
T ₁₂ (Alachlor 1.0 + Atrazine 0.5 kg a.i./ha)	171.7	3.43	85.8	1.58	14.7	330.1	122.5	48.95	68.33
T ₁₃ (Alachlor 1.25 + Atrazine 0.5 kg a.i./ha)	171.3	3.50	86.3	1.69	16.5	334.7	125.2	51.55	67.95
T ₁₄ (Alachlor 1.50 + Atrazine 0.5)	169.8	3.53	88.3	1.76	16.9	341.7	129.5	53.50	69.85
CD (P = 0.05)	6.55	0.14	4.86	0.16	1.81	16.65	18.4	7.91	9.39

E.U., Earthing up

*In case of treatments T₃ and T₇, maize yield equivalence of smother crop French bean was included

bean (smother crop), being the second best was on a par with hand-weeding twice. Amongst chemical treatments, Atrazine 1.5 kg a.i./ha + 2,4-D 0.8 kg a.i./ha proved the best followed by Alachlor 1.5 kg a.i./ha + Atrazine 0.5 kg a.i./ha. Rest of the treatments were at par with each other but significantly superior to weedy check. Low weed population and reduced crop-weed competition consequently encouraged better yield components and thus resulted in higher yields. Similar results were also reported by Prusty *et al.* (1987) and Singh *et al.* (1995). Similar trend was also noticed for stover yield of winter maize (Table 1).

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