Indian Journal of Weed Science (2026) **58**(1): 130–132
http://dx.doi.org/10.5958/0974-8164.2026.00020.0

RESEARCH NOTE

Weeds, castor yield attributes and yield as influenced by weed management

E. Priyankabai*, P.V.N. Prasad and B. Venkateswarlu

Received: 13 February 2025 | Revised: 19 November 2025 | Accepted: 21 November 2025

ABSTRACT

A field experiment was conducted at Agricultural College Farm, Bapatla, Andhra Pradesh during *Kharif* 2020 to assess the effect of weed management treatments on weeds, yield attributes and yield of castor. The hand weeding twice at 20 and 40 days after seeding (DAS) recorded the lowest density and biomass of all the categories of weeds as well as the highest weed control efficiency, yield attributes and yield of castor. Next best treatments were pre-emergence application (PE) of alachlor 1.5 kg/ha followed by (*fb*) post-emergence application (PoE) chlorimuron-ethyl 10 g + propaquizafop 63 g/ha at 30 DAS or alachlor 1.5 kg/ha PE *fb* application of halosulfuron-methyl 67.5 g + propaquizafop 63 g/ha PoE at 30 DAS. The benefit cost ratio was highest with alachlor 1.5 kg/ha PE *fb* halosulfuron-methyl 67.5 g + propaquizafop 63 g/ha PoE at 30 DAS.

Keywords: Alaclor, castor, chlorimuron-ethyl + propaquizafop, halosulfuron-methyl + propaquizafop, Weed control efficiency

Castor (*Ricinus communis* L.), is a member of the Euphorbiaceae family and the most archaic non-edible oilseed crop. Castor oil has been used almost entirely for pharmaceutical and industrial applications. Castor is grown in tropical, subtropical and temperate areas. India is the world's leading producer, accounting for 68% and 85% of global acreage and production, respectively, ahead of China and Brazil. India produced 19,79,718 tons of castor seed from 10,19,279 hectares with a productivity of 1.94 t/ha during 2023-24 (FAOSTAT 2025). The major castor producing states of India are Gujarat, Rajasthan, Andhra Pradesh and Telangana.

Castor productivity is influenced by a variety of agronomic factors. Weed management is the major limiting factor for achieving optimal castor productivity and production. Castor plants are particularly sensitive to weed competition because to their slow initial development as weeds compete available nutrients and other resources during the early growth phases, causing considerable yield losses up to 30-60 % (Mishra *et al.* 2016, Kalaichelvi and Senthil Kumar 2016, Naik *et al.* 2016). Considering the castor crop should be kept weed free up to initial 90 days after sowing, which is more crucial for crop-weed competition (Patel *et al.* 2014). Thus, weed control during the critical period of crop growth is a vital for successful castor production (Mishra *et al.* 2016). Herbicides were proved to be a viable option and play a critical role in weed management in castor as herbicides are effective, selective, cost effective and efficient in controlling weeds when used alone or in combination with other weed control methods (Kalaichelvi and Senthil Kumar 2016). The use of herbicides as pre-emergence treatments, either alone or in combination followed by one or more post-emergence treatments, can be an effective method for weed control (Naik *et al.* 2016). This study was conducted with an objective to identify suitable herbicides either alone or as sequential application for managing weeds and improve the productivity of castor.

This study was conducted during the *Kharif*, 2020 at the Agricultural College Farm in Bapatla, Andhra Pradesh. The soil had a clay texture, a neutral reaction, medium organic carbon, low available nitrogen, medium available phosphorus and potassium. The experiment was set up in a Randomized Block Design, with ten treatments, *viz.* weedy check, hand weeding twice at 20 and 40 days after seeding (DAS), pre-emergence application (PE) of alachlor 1.5 kg/ha; post-emergence application (PoE) of chlorimuron-ethyl 10 g/ha at 20 DAS, halosulfuron-methyl 67.5 g/ha PoE at 20 DAS; propaquizafop 63 g/ha PoE at 30 DAS; alachlor 1.5 kg/ha PE followed by (*fb*) chlorimuron-ethyl 10 g/ha PoE at 30 DAS; alachlor 1.5 kg/ha PE *fb* halosulfuron-methyl l67.5 g/ha PoE at 30 DAS; alachlor 1.5 kg/ha PE *fb* chlorimuron- ethyl 10 g + propaquizafop 63 g/ha PoE at 30 DAS; alachlor 1.5

Department of Agronomy, Agricultural College, Bapatla, ANGRAU, Andhra Pradesh 522101, India

* Corresponding author email: e.priyanka127@gmail.com

kg/ha PE *fb* halosulfuron- methyl 67.5 g + propaquizafop 63 g/ha PoE at 30 DAS. The castor hybrid (PCH-111) was sown at 90 x 60 cm spacing by hand dibbling method. Gap filling and thinning were completed at 10 DAS. A 60-40-30 kg N-P_2O_5-K_2O/ha fertilizer dose was applied in the form of urea, single superphosphate and muriate of potash, respectively. Using the pocketing approach, nitrogen was supplied in three equal split (30, 60 and 90 DAS), and potassium and phosphorus were applied basally at the time of planting. One day after seeding, pre-emergence herbicide (alachlor) was sprayed. The post-emergence herbicides (chlorimuron-ethyl, halosulfuron-methyl and propaquizafop) were sprayed at 20 and 30 DAS as per the treatments, using a backpack sprayer equipped with a flood jet nozzle. Category wise weed density and biomass were recorded using quadrat of 1x1 m^2 at 45 DAS and at harvest. Statistical significance was tested by F value at 5 per cent level of probability and the critical difference was worked out wherever the effects were significant. In view of the larger variation in the recorded values of weed density and biomass, the corresponding data were subjected to square root transformation ($\sqrt{X+0.5}$), weed control efficiency and weed index were subjected to angular transformation before subjecting to statistical analysis, as suggested by Gomez and Gomez (1984).

The predominant weed species observed in the experimental field of castor were *Celosia argentea, Phyllanthus niruri, Euphorbia hirta, Trianthema portulacastrum, Tridax procumbens, Alternanthera philoxeroides* and *Cardiospermum helicacabum,* among broad- leaved weeds; *Cynodon dactylon,* among grasses and *Cyperus rotundus* among sedges.

Effect on weeds

The minimum density and biomass of grasses, sedges and broad-leaved weeds and higher weed control efficiency were recorded with hand weeding twice at 20 and 40 DAS, which was on a par with alachlor 1.5 kg/ha PE *fb* chlorimuron-ethyl 10 g + propaquizafop 63 g/ha PoE at 30 DAS, alachlor 1.5 kg/ha PE *fb* halosulfuron-methyl 67.5 g + propaquizafop 63 g/ha PoE at 30 DAS and propaquizafop 63 g/ha PoE at 30 DAS (**Table 1**). At 45 DAS and at harvest a similar trend of treatments effect was observed in density and biomass of grasses, sedges, broad-leaved weeds and total weeds. Halosulfuron-methyl effectively controlled the sedges and turf weeds, while propaquizafop was found to control the annual and perennial grasses. The sequential application of pre-emergence application followed by tank-mix of two herbicides as post-emergence application was found to be effective in controlling broad spectrum of weeds, compared to sole application of an herbicide either as pre- or post-emergence as observed in the present study. The highest density and biomass of total weeds was recorded in weedy check which can be attributed to the absence of control measures and optimal conditions for weed growth and reproduction.

Table 1. Density and biomass of weeds and weed control efficiency at 45 DAS as influenced by different weed management treatments

Treatment	Weed density (no./m^2)				Weed dry matter (kg/ha)				Weed control efficiency (%)
	Grasses	Sedges	BLWs	Total	Grasses	Sedges	BLWs	Total	
Weedy check	9.7 (94.7)	7.5 (55.3)	8.0 (64.0)	14.6 (214.0)	11.4 (130.4)	8.3 (67.9)	6.6 (42.8)	15.5 (241.1)	-
Hand weeding twice at 20 and 40 DAS	2.6 (6.4)	2.7 (6.7)	2.7 (6.7)	4.5 (19.7)	1.5 (1.8)	1.5 (1.7)	1.6 (2.1)	2.5 (5.6)	97.7
Alachlor 1.5 kg/ha PE	6.7 (44.0)	7.2 (52.0)	7.0 (49.3)	12.1 (145.3)	8.3 (69.2)	7.3 (53.3)	5.6 (31.1)	12.4 (153.6)	36.3
Chlorimuron-ethyl 10 g/ha PoE at 20 DAS	7.9 (61.9)	5.8 (33.7)	4.1 (16.3)	10.6 (111.9)	9.0 (80.3)	6.0 (35.2)	2.6 (6.5)	11.1 (122.0)	49.4
Halosulfuron-methyl 67.5 g/ha PoE at 20 DAS	7.6 (58.3)	3.8 (14.3)	5.8 (32.7)	10.3 (105.3)	8.5 (72.3)	2.4 (5.3)	4.7 (21.5)	10.0 (99.2)	58.9
Propaquizafop 63 g/ha PoE at 30 DAS	3.2 (9.9)	7.2 (51.7)	7.9 (62.3)	11.1 (123.9)	1.7 (2.6)	7.4 (54.5)	6.4 (40.8)	9.9 (98.0)	59.4
Alachlor 1.5 kg/ha PE *fb* chlorimuron-ethyl 10 g/ha PoE at 30 DAS	6.3 (39.1)	5.1 (25.3)	3.1 (9.0)	8.6 (73.4)	7.7 (58.6)	5.7 (32.5)	2.3 (4.6)	9.8 (95.8)	60.3
Alachlor 1.5 kg/ha PE *fb* halosulfuron-methyl 67.5 g/ha PoE at 30 DAS	6.1 (37.0)	3.3 (10.7)	4.6 (21.0)	8.3 (68.7)	7.5 (56.5)	1.7 (2.7)	4.2 (17.3)	8.8 (76.6)	68.2
Alachlor 1.5 kg/ha PE *fb* chlorimuron-ethyl 10 g + Propaquizafop 63 g/ha PoE at 30 DAS	2.8 (7.3)	4.8 (22.3)	3.0 (8.3)	6.2 (38.0)	1.5 (2.0)	3.9 (15.4)	1.6 (2.2)	4.5 (19.6)	91.9
Alachlor 1.5 kg/ha PE *fb* halosulfuron-methyl 67.5 g + propaquizafop 63 g/ha PoE at 30 DAS.	2.8 (7.6)	3.2 (10.0)	4.8 (22.3)	6.4 (39.9)	1.7 (2.4)	1.6 (2.3)	4.3 (18.2)	4.8 (22.9)	90.5
LSD (p=0.05)	0.9	0.8	0.9	0.9	1.0	0.8	0.9	1.1	5.1

Data in parentheses are original values, which are transformed to ($\sqrt{X+0.5}$) and analysed statistically, *fb*=followed by; DAS = days after seeding; PE = pre-emergence application; PoE= post-emergence application

Table 2. Castor yield attributes, yield and economics as influenced by different weed management treatments in castor

Treatment	No. of spikes/ plant	No. of capsules/ spike	Spike length (cm)	Test weight (g)	Seed yield (t/ha)	Weed index (%)	Net returns (Rs/ha)	B:C ratio
Weedy check	4.7	61.6	32.9	25.9	1.35	45.5	26942	1.14
Hand weeding twice at 20 and 40 DAS	7.7	93.3	47.4	30.5	2.48	-	60895	1.90
Alachlor 1.5 kg/ha PE	5.2	64.7	34.8	26.6	1.62	34.6	35287	1.38
Chlorimuron-ethyl 10 g/ha PoE at 20 DAS	5.2	77.6	35.2	25.5	1.88	24.1	46509	1.93
Halosulfuron-methyl 67.5 g/ha PoE at 20 DAS	5.3	75.6	34.7	26.4	1.83	26.3	41047	1.49
Propaquizafop 63 g/ha PoE at 30 DAS	5.3	78.0	35.8	27.0	1.94	21.8	47658	1.90
Alachlor 1.5 kg/ha PE *fb* chlorimuron-ethyl 10 g/ha PoE at 30 DAS	5.7	81.0	39.4	28.4	2.12	14.7	53429	2.06
Alachlor 1.5 kg/ha PE *fb* halosulfuron-methyl 67.5 g/ha PoE at 30 DAS	5.6	79.5	38.8	28.7	2.06	16.8	48130	1.64
Alachlor 1.5 kg/ha PE *fb* chlorimuron-ethyl 10 g + propaquizafop 63 g/ha PoE at 30 DAS	7.0	85.6	43.0	29.5	2.39	3.8	62276	2.29
Alachlor 1.5 kg/ha PE *fb* halosulfuron-methyl 67.5 g + propaquizafop 63 g/ha PoE at 30 DAS.	6.6	83.9	41.7	28.9	2.33	6.3	56589	1.85
LSD (p=0.05)	1.3	11.6	6.7	NS	0.25	10.5	9466	0.33

NS=Not Significant.; *fb*=followed by; DAS = days after seeding; PE = pre-emergence application; PoE= post-emergence application

Effect on crop

The castor yield attributes, *viz.* number of spikes/ plant, number of capsules/spike, spike length (cm), seed yield and economics were significantly influenced by different weed management practices (**Table 2**). The test weight of castor was not significantly influenced by different weed management treatments. Among the tested weed management treatments, significantly the higher values of yield attributes and yield of castor were recorded with hand weeding at 20 and 40 DAS followed by alachlor 1.5 kg/ha PE *fb* chlorimuron-ethyl 10 g + propaquizafop 63 g/ha PoE at 30 DAS and alachlor 1.5 kg/ha PE *fb* halosulfuron-methyl 67.5 g + propaquizafop 63 g/ha as PoE 30 DAS. The timely management of weeds by these treatments resulted in reduction in weed impact especially during the critical period of crop weed competition resulting in better foliage development, which finally reflected in the highest values of yield and yield attributes. Significantly the lowest values of yield attributes were observed under weedy check. The lowest weed index observed in hand weeding at 20 and 40 DAS is due to complete removal of weeds at critical period of crop weed competition. Among the herbicide treatments, the lowest weed index was noticed with alachlor 1.5 kg/ha PE *fb* chlorimuron-ethyl 10 g + propaquizafop 63 g/ha PoE at 30 DAS confirming the findings of Patel *et al.* (2014). The highest benefit cost ratio was observed with alachlor 1.5 kg/ha PE *fb* chlorimuron-ethyl 10 g + propaquizafop 63 g/ha PoE at 30 DAS (**Table 2**).

It was concluded that alachlor 1.5 kg/ha PE *fb* chlorimuron-ethyl 10 g + propaquizafop 63 g/ha PoE at 30 DAS or alachlor 1.5 kg/ha PE *fb* halosulfuron-methyl 67.5 g + propaquizafop 63 g/ha PoE at 30 DAS or hand weeding twice at 20 and 40 DAS recorded effective weed control with higher castor yield attributes and seed yield.

REFERENCES

FAOSTAT. 2025. FAOSTAT, FAO, Rome. Data downloaded on 8 June 2025.

Gomez KA and Gomez AA. 1984. *Statistical Procedures in Agricultural Research*. pp: 96–98. 2nd edition, New York Chichester Wiley. 1984.

Kalaichelvi K and Senthil Kumar G. 2016. Chemical weed management in castor. *Indian Journal of Weed Science* **48**(1): 95–96.

Mishra JS, Rao AN, Singh VP and Rakesh Kumar. 2016. Weed management in major field crops. Chapter 9. Pages 1-20 in: Advances in Weed Management (Eds, Yaduraju NT *et al.*). Indian Society of Weed Science, Jabalpur, M.P., India.

Naik AHK, Sridhara S and Sanjay MT. 2016. Pre- and post-emergent herbicides for control of castor weeds. *Indian Journal of Weed Science* **48**(3): 304–308.

Patel DD, Thanki JD, Usdadiya VP, Arvadia MK, Tandel BB and Patil PA. 2014. Effect of critical period of crop-weed competition on nutrient content and uptake by weed and *Rabi* castor (*Ricinus communis* L.). *Research on Crops* **15**(4): 816–823.