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Integrated Weed Management in Castor: A Smarter Approach for Semi-Arid Regions

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Castor (*Ricinus communis* L.) is an important non-edible oilseed crop of India. Its oil is widely used in medicines, lubricants, cosmetics, bio-diesel, and many industrial products. India is the world leader in castor cultivation, and Gujarat, Rajasthan, Andhra Pradesh, and Telangana are the main growing states. Although castor has high industrial value and good export demand, its productivity often suffers because of heavy weed infestation.

Weeds are the most serious problem in castor farming. This crop grows slowly in the early stages and has wide spacing between plants, which allows weeds to grow rapidly. Hot and humid weather in the *Kharif* season further supports fast weed growth. These weeds compete with the crop for nutrients, moisture, sunlight, and space. If not controlled in time, weeds can cause 30–80% yield loss in castor. Traditionally, farmers manage weeds by intercultural operations and hand weeding. While effective, these practices are costly and time-consuming due to rising labour shortages. On the other hand, using only herbicides may control weeds in the beginning but cannot provide season-long protection, and continuous use may lead to weed resistance or other environmental issues.

Therefore, the best solution is Integrated Weed Management (IWM). This approach combines pre-emergence herbicides like pendimethalin or oxyfluorfen with timely intercultural and hand weeding. Herbicides control the first flush of weeds effectively, while later hand weeding and intercultural operations keep the field clean until harvest. Field trials in Gujarat have shown that IWM not only reduces weed density and dry weight but also improves plant growth, increases spike number and length, and boosts castor seed yield significantly compared to weedy check or herbicide alone. Integrated weed management is thus a practical, economical, and sustainable option. It helps farmers save labour costs, ensures better crop growth, and increases castor productivity, making it an ideal technology for long-term adoption.

Why weeds are such a big problem in castor?

- **Slow early growth:** Castor seedlings take time to establish.
- **Wide spacing:** Gaps between plants allow weeds to flourish.
- **Rainy season conditions:** Warm and humid weather promotes fast weed germination.
- **Strong competition:** Weeds absorb more nutrients and water, leaving little for castor.

Result: Stunted plants, fewer spikes and branches/plant, yield attributes and reduced seed yield.

The experimental soil was a loamy sand low in organic carbon (0.43%) and nitrogen (169 kg/ha), medium in phosphorus (25.7 kg/ha), but rich in potassium (253.5 kg/ha). Into this soil, the widely adopted castor hybrid GCH 7 with maintaining a spacing of 120 × 60 cm with a modest seed rate of 6 kg/ha. Each plot stretched across a gross area of 5.4 × 4.8 m, neatly trimmed into a net plot of 4.8 × 4.8 m. The crop was fed with the recommended 75-50-

00 kg/ha NPK, supplied through urea and diammonium phosphate ensuring a uniform baseline of nutrition across all treatments.

The experiment followed a randomized complete block design (RBD) with ten weed management strategies replicated thrice. The line-up was a thoughtful blend of traditional hand weeding and modern herbicide regimens, tested both alone and in combinations. Herbicides for pre-plant incorporation (PPI) were worked into the soil a day before the first irrigation, while pre-emergence (PE) sprays followed two days after sowing. Post-emergence (PoE) interventions were carefully timed at 30 DAS with a knapsack sprayer (flat-fan nozzle, 500 L water/ha) ensuring even delivery. For PoE applications, a protective hood was used to shield castor foliage targeting only the weeds thriving between rows.

Result

The field investigation clearly highlighted that unchecked weed growth in castor severely hampers plant height, spike development, and seed yield, causing yield reductions of more than 30–40%. Weeds compete aggressively for nutrients, sunlight, and soil moisture, leaving the crop weak and unproductive. However, the study demonstrated that integrated weed management (IWM) the combination of pre-emergence herbicides such as pendimethalin 30% EC or oxyfluorfen 23.5% EC applied soon after sowing followed by one interculturing and a hand weeding at 40 DAS was the most effective strategy. This approach not only reduced weed density and biomass significantly but also improved crop growth, resulting in taller plants, more spikes per plant, longer main spikes, and ultimately higher seed yields. Moreover, the benefit-cost ratio was superior under IWM due to reduced labour costs and higher marketable yield, proving it to be both economically viable and environmentally safe.

- Intercultural operations followed by hand weeding at 20, 40 and 60 DAS should be adopted as the most effective strategy for weed management in castor where labour availability is not a constraint, as it ensures maximum weed suppression and yield gains.
- In areas with labour shortage or high labour cost, pendimethalin 30% EC @ 1000 g a.i./ha PE followed by intercultural operations followed by hand weeding at 40 DAS or oxyfluorfen @ 23.5% EC 117.5 a.i. g/ha PE followed intercultural operations followed by hand weeding at 40 DAS are recommended as economically viable alternatives. These treatments provide yields statistically comparable to full mechanical management while saving 25–30% labour inputs.
- Exclusive reliance on herbicides without follow-up intercultural/hand weeding should be discouraged, as it may lead to partial weed control, resurgence, and potential weed resistance. Similarly, weedy fields should be strictly avoided as they cause up to 40–50% yield losses in castor.
- Adoption of integrated weed management (IWM) ensures sustainable productivity by combining the early weed suppression of herbicides with the season-long control of mechanical practices, thereby promoting higher seed yield, profitability, and long-term soil health.
- Farmers in semi-arid and sub-humid regions of Gujarat and similar agro-climatic zones may adopt these herbicide-integrated strategies for large-scale castor production to maximize yield and profitability under changing labor and climatic scenarios. By adopting IWM, farmers can save labour, reduce costs, improve yield and ensure better profitability, while also keeping their castor fields healthy and sustainable for the future.

Conclusion

Based on two years of experimentation, it can be concluded that pendimethalin 30% EC at 1000 g a.i./ha PE *fb* IC + HW at 40 DAS or oxyfluorfen 23.5% EC at 117.5 g a.i./ha PE *fb* IC + HW at 40 DAS, or interculturing *fb* hand weeding at 20, 40 and 60 DAS proved most effective for weed suppression, securing higher yield and net returns, without any residual effect on succeeding crops

Cautions and best practices (safety & resistance management)

- **Follow product label** exactly: dose, water volume, application timing, pre-harvest intervals. Labels provide crop safety and environmental guidance.
- **Personal safety:** Use PPE (gloves, mask, protective clothing) during mixing and spraying. Avoid drift onto non-target crops.
- **Resistance management:** Rotate herbicide modes of action across seasons and incorporate mechanical removal to reduce resistance risk.
- **Avoid spraying before heavy rain** (may wash herbicides away) and avoid post-emergence herbicide overlaps that can damage castor — always check compatibility.
- **Environmental care:** Do not apply near water bodies; follow buffer zone recommendations.

Effect of pendimethalin PE fb IC + HW at 40 DAS on weeds at 35 DAS

Weedy situation under weedy check at 35 DAS

References

1. Dungarwal H.S., Chaplot, P.C. and Nagda B.L. 2002. Weed control in castor (*Ricinus communis* L.). *Indian Journal of Agricultural Sciences* **72**(9): 525-527.
2. Kalaichelvi, K. and Kumar, S.G. 2016. Chemical weed management in castor. *Indian Journal of Weed Science* **48**(1): 95-96.
3. Manickam, S., Kalaiselvan, P., Subramaniyan, K. and Venkatachalam, S.R. 2009. Role of herbicide in castor based intercropping system. *Journal of Phytological Research* **22**(2): 291-294.
4. Patel, A.J., Virdia, H.M., Desai, S.K. and Deshmukh, S.P. 2014. Effect of weed management on growth and yield of rabi castor (*Ricinus communis* L.) under South Gujarat conditions. *Trends in Biosciences* **7**(8): 632-635.
5. Singh I., Rathore, M.S., Mehriya, M.L., Chawra, R.S. and Chandawat, M.S. 2013. Weed management in irrigated castor (*Ricinus communis* L.) through herbicides. *Journal of Oilseeds Research* **30**(2): 150-153.
6. Vaghasia, P.M. and Nadiyadhara, M.V. 2016. Influence of pre and post-emergence herbicide in castor (*Ricinus communis* L.). *Research on Crops* **17**(1): 68-72.