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Rapeseed–Mustard: A Promising Crop for Transforming Rice Fallows in Chhattisgarh

*Niranjan Prasad[1], Pankaj Sharma[1], Sandeep Adavi[1], Sanket Kaushik[1], Harish M N[2] and Lakshmipathy M[3]
[1]ICAR-National Institute of Biotic Stress Management, Baronda, Raipur, Chhattisgarh-493225, India
[2]ICAR-Agricultural Technology Application Research Institute, Jabalpur, Madhya Pradesh -482004, India
[3]ICAR-Directorate of Floricultural Research, Regional Station, Vemagiri, East Godavari, Andhra Pradesh-533125, India
*Corresponding Author's email: pksvirus@gmail.com

Rapeseed–mustard (*Brassica* spp.) is the second most important edible oilseed crop in India and plays a pivotal role in ensuring edible oil security, enhancing farmers' income and promoting sustainable agriculture. Despite favourable agro-climatic conditions, vast rice-fallow areas and increasing irrigation potential, rapeseed–mustard cultivation in Chhattisgarh remains confined to a limited area with productivity considerably below the national average. This article highlights the immense potential of expanding rapeseed–mustard cultivation in the state's rice-based production systems through the adoption of scientific crop management practices. It comprehensively discusses the crop's global and national importance, production scenario, suitability under Chhattisgarh conditions, recommended varieties, optimum sowing time, seed treatment, nutrient, irrigation and weed management, major insect pest, harvesting, storage and best management practices. The article also emphasizes the economic and ecological benefits of integrating rapeseed–mustard into rice-fallow ecosystems, including enhanced cropping intensity, efficient utilization of residual soil moisture, improved soil health, support for beekeeping and increased farm profitability. Adoption of improved varieties, quality seed, balanced fertilization, integrated pest and disease management and timely harvesting can substantially enhance productivity and profitability while contributing to India's mission of achieving self-reliance in edible oil production. Expanding rapeseed–mustard cultivation in Chhattisgarh offers a sustainable pathway for improving farmers' livelihoods, strengthening oilseed production and promoting climate-resilient and resource-efficient agricultural systems.

Keywords: Rapeseed–mustard, Chhattisgarh, rice-fallow lands, crop diversification, oilseed production.

Introduction

Rapeseed–mustard (*Brassica* spp.) is the world's third most important source of edible vegetable oil after soybean and oil palm and is cultivated across temperate, subtropical and tropical regions. The crop comprises several species, including Indian mustard (*Brassica juncea*), rapeseed (*Brassica rapa*), gobhi sarson (*Brassica napus*), brown sarson and toria, which together contribute significantly to global food and nutritional security (Sharma et al., 2025). Besides being an excellent source of high-quality edible oil, rapeseed–mustard also provides protein-rich oilseed meal for livestock, green fodder, raw material for biodiesel and various industrial products, while its bright yellow flowers support beekeeping and enhance honey production. Globally, rapeseed–mustard is cultivated on nearly 44 million hectares,

producing about 90 million tonnes of seed with an average productivity of approximately 2.0 t ha^{-1}, making it one of the most economically important oilseed crops in the world (FAO, 2025). India is the third-largest producer of rapeseed–mustard after Canada and China, contributing more than 13% of global production. The crop is the country's second most important edible oilseed crop after soybean, accounting for nearly 36% of domestic edible oil production and serving as a major source of livelihood for millions of small and marginal farmers. During 2024–25, rapeseed–mustard occupied about 8.63 million hectares with a production of 12.61 million tonnes and an average productivity of 1,461 kg ha^{-1} (DES, 2026). Although remarkable progress has been achieved through the development of improved varieties and scientific crop management, India's average productivity remains substantially lower than the global average, indicating considerable scope for yield enhancement through improved production technologies.

Importance of Rapeseed–Mustard in Chhattisgarh

Chhattisgarh, popularly known as the "Rice Bowl of Central India," has traditionally depended on Kharif rice as the cornerstone of its agricultural economy. While rice cultivation ensures food security and provides assured returns through government procurement, vast stretches of agricultural land remain uncultivated after paddy harvest. This underutilization of rice fallows limits cropping intensity, reduces farm income, and leaves valuable natural resources underexploited. Cultivating rapeseed–mustard in these rice fallows offers an excellent opportunity to increase farmers' income, improve land-use efficiency, enhance domestic edible oil production, and promote sustainable agriculture. Rapeseed–mustard has emerged as one of the most suitable Rabi crops for rice-fallow ecosystems because of its wide adaptability, low water requirement, and short crop duration. In Chhattisgarh, the optimum sowing window extends from the second fortnight of November to the first week of December, when winter temperatures generally range between 20 and 30°C, providing favourable conditions for crop establishment, growth, and development. The crop matures within 90–120 days, enabling it to fit seamlessly into the post-Kharif cropping calendar. Rapeseed–mustard offers a threefold advantage to farmers by requiring relatively low cultivation costs, benefiting from an attractive Minimum Support Price (MSP), and effectively utilizing otherwise vacant rice-fallow lands. Despite its immense potential, rapeseed–mustard occupies only about 31,000 hectares in Chhattisgarh, with an annual production of approximately 17,260 tonnes and an average productivity of 563 kg per hectare. Research conducted under rice-fallow conditions has shown that adoption of improved production technologies can increase seed yield by more than 20 per cent compared with traditional farmer practices. Rapeseed–mustard is particularly suitable for the central plains of Chhattisgarh, including Raipur, Durg, Balod, Bemetara, Rajnandgaon, Kabirdham, Mahasamund, Dhamtari and Bilaspur, where fertile alluvial and clay-loam soils, moderate winter temperatures and expanding irrigation facilities provide favourable conditions for crop growth. The crop also has good potential in irrigated pockets of Korba, Janjgir-Champa, Raigarh, Surguja and Balrampur, where winter cultivation is steadily increasing. These regions offer favourable climatic conditions, adequate sunshine during flowering and seed development, and opportunities for integrating mustard into existing rice-based cropping systems.

Climate and Soil Requirements

Rapeseed–mustard is a cool-season (rabi) crop that thrives under moderate winter temperatures and performs best in regions with a cool, dry climate. The crop requires an optimum temperature of 20–25°C for seed germination, which ensures rapid and uniform crop establishment. During the flowering and pod development stages, relatively cooler temperatures of 15–20°C are ideal for proper pollination, fertilization and seed setting. Bright sunshine during the seed filling and maturity stages promotes efficient photosynthesis, improves oil accumulation and enhances both seed yield and quality. The crop can be successfully cultivated on a wide range of soils; however, well-drained loam to clay-loam

soils rich in organic matter are considered most suitable for obtaining higher productivity. Rapeseed–mustard performs well in soils with a pH ranging from 6.0 to 8.0. Since the crop is highly sensitive to excess moisture, proper drainage should be ensured throughout the growing period. Waterlogging adversely affects root growth, reduces nutrient uptake, encourages the development of soil-borne diseases and ultimately lowers crop yield and seed quality. Therefore, fields with good drainage and adequate soil aeration should be preferred for cultivation.

Table 1: Recommended production practices for rapeseed–mustard cultivation.

Practice	Recommendation
Suitable varieties	DRMR 150-35, NRCHB-101, Chhattisgarh Sarson, TBM-209 and BBM-1.
Time of sowing	Mid-October to mid-November (after kharif rice harvest).
Seed rate	4–5 kg ha^{-1}.
Row spacing	30–45 cm.
Plant spacing	10–15 cm.
Sowing depth	3–4 cm.
Sowing method	Line sowing with seed drill or seed-cum-fertilizer drill.
Seed treatment	Carbendazim @ 2 g kg^{-1} seed or Thiram + Carbendazim @ 3 g kg^{-1} seed.
Biofertilizer	Inoculate seed with Azotobacter and PSB after fungicidal treatment.

Nutrient Management

Balanced nutrient management is one of the key factors for achieving higher seed yield, improved oil content and better crop health in rapeseed–mustard. Since the crop has a relatively high requirement for nutrients, the application of fertilizers in the right quantity and at the appropriate time is essential for optimum growth. As a general recommendation, 80–100 kg nitrogen (N), 40–50 kg phosphorus (P_2O_5), 20–30 kg potassium (K_2O) and 20–30 kg sulphur per hectare should be applied.

Irrigation Management

The most important stages for irrigation are the branching stage, flower initiation stage and pod filling stage, as moisture stress during these periods can adversely affect flowering, siliqua development and seed filling. Irrigation should be applied judiciously, avoiding both moisture stress and excessive watering. Waterlogging is particularly harmful because it restricts root respiration, reduces nutrient uptake and favours the development of soil-borne diseases, ultimately leading to poor crop growth and reduced productivity. Therefore, proper drainage should be ensured, especially in heavy soils.

Weed Management

Effective weed management during the early stages of crop growth is essential for obtaining a healthy crop stand and maximizing yield. Weeds compete aggressively with mustard plants for nutrients, soil moisture, sunlight and space, particularly during the first 40–45 days after sowing, which is considered the critical period of crop-weed competition. If left uncontrolled, weeds can cause substantial reductions in growth, seed yield and oil content. Under normal conditions, the first hand weeding should be carried out 20–25 days after sowing, followed by a second weeding at 40–45 days after sowing to keep the field free from weed infestation. Where labour availability is limited, suitable pre- or post-emergence herbicides recommended by agricultural experts may be integrated with manual weeding as part of an integrated weed management strategy. Timely weed control not only improves nutrient and moisture utilization but also enhances crop growth, facilitates field operations and ultimately contributes to higher productivity and profitability.

Major Insect Pests

Mustard Aphid (*Lipaphis erysimi*)

Mustard aphid (*Lipaphis erysimi*) is the most important insect pest of rapeseed–mustard in iChhattisgarh. The pest generally appears during the flowering stage and multiplies rapidly under cool and dry weather conditions. Both nymphs and adults suck sap from tender leaves, flower buds, inflorescences and developing siliquae, causing severe damage to the crop. Infested plants exhibit curling and distortion of leaves, yellowing, stunted growth and poor pod development. Heavy infestation interferes with flowering and seed filling, resulting in shrivelled seeds, reduced test weight, lower oil content and substantial yield losses. In addition, aphids excrete honeydew, which promotes the growth of black sooty mould, further reducing photosynthetic efficiency and plant vigour. Farmers should regularly monitor their fields, particularly from the flowering stage onwards, for early detection of aphid colonies. Installation of yellow sticky traps helps in monitoring aphid populations, while conservation of natural enemies such as ladybird beetles, lacewings and hoverflies contributes to biological control. When aphid populations exceed the economic threshold level (ETL), recommended insecticides should be applied judiciously following the recommendations of the State Department of Agriculture or Krishi Vigyan kendra.

Crop production of Mustard variety DRMR-150-35 at ICAR-NIBSM, Raipur

Ideotype mustard plant grown in Mustard field at ICAR-NIBSM

Harvesting and Storage

Timely harvesting is essential for obtaining maximum seed yield and maintaining high seed quality in rapeseed–mustard. The crop should be harvested when approximately 75–80% of the siliquae turn yellow or light brown, while the remaining pods are still slightly green. Delayed harvesting may lead to shattering of siliquae, resulting in significant seed losses, whereas premature harvesting produces immature seeds with lower oil content and poor storage potential. Harvesting is preferably carried out during the early morning or late evening hours to minimize shattering losses. After harvesting, the crop should be properly dried in the field or on clean threshing floors before threshing. The seeds should then be cleaned thoroughly to remove inert matter, broken seeds and other impurities. For safe long-term storage, the seed moisture content should be reduced to below 8%, as higher moisture levels favour insect infestation and fungal growth. Seeds should be stored in clean, dry, well-ventilated and insect-free storage structures using moisture-proof bags or bins. Periodic inspection during storage helps detect insect pests or moisture build-up at an early stage, thereby preserving seed viability, oil quality and market value.

Expected Yield

Under normal rainfed conditions, farmers can obtain an average seed yield of 10–15 quintals per hectare, whereas under irrigated conditions, yields of 18–25 quintals per hectare are achievable with improved production technologies.

Economic Benefits

Rapeseed–mustard is a low-input, high-value oilseed crop that fits exceptionally well into the rice-based cropping systems of Chhattisgarh. Cultivating mustard immediately after rice harvest enables farmers to utilize otherwise fallow land during the rabi season, thereby increasing cropping intensity and generating additional income without substantial investment. In addition to producing high-quality edible oil, the crop provides protein-rich oilseed cake, which serves as valuable livestock feed and organic manure. The crop residues can be utilized as fodder or incorporated into the soil to improve soil organic matter. Furthermore, the bright yellow mustard flowers provide abundant nectar and pollen, making the crop highly suitable for beekeeping, which offers an additional source of income through honey production while enhancing pollination. Rapeseed–mustard also contributes to crop diversification, improves soil health, breaks pest and disease cycles associated with continuous rice cultivation and promotes efficient utilization of residual soil moisture in rice-fallow areas.

Best Management Practices

ICAR–National Institute of Biotic Stress Management, Raipur has actively taken up the promotion of rapeseed-mustard cultivation in Chhattisgarh through scientific research and institutional interventions particularly putting demonstrations under SCSP and TSP schemes. Field evaluations conducted during last three years revealed encouraging results for the variety DRMR-150-35, which exhibited early maturity like 95–110 days, making it highly suitable for sowing during mid-November to first week of December after rice harvest. Notably, no incidence of key pests and diseases was observed except aphids, indicating its strong adaptability for biotic stress tolerance.

Conclusion

Rapeseed–mustard has tremendous potential to enhance farmers' income and strengthen edible oil production in Chhattisgarh. Scientific crop management, timely sowing, quality seed, balanced nutrition, efficient irrigation and integrated pest management can substantially improve productivity and profitability. Expansion of rapeseed–mustard cultivation in rice-fallow areas will not only increase oilseed production but also promote sustainable agriculture, resource-use efficiency and livelihood security for farming communities across the state.

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