JUST AGRICULTURE
multidisciplinary e-Newsletter

Advances in Agronomic Management of Indian Mustard (*Brassica juncea*)

Vikram Bharati[1], Kumar N Lamani[2] , and Manoj Kumar[3]

[1,2]Department of Agronomy, [3]Department of Entomology

Dr. Rajendra Prasad Central Agricultural University, Bihar, Pusa

Corresponding author: vbharatiagro@gmail.com

ARTICLE ID: 026

Introduction

India is the fourth largest oilseed economy in the world. Among the seven edible oilseeds cultivated in India, rapeseed-mustard contributes 28.6% in the total oilseeds production and ranks second after groundnut sharing 27.8% in the India's oilseed economy. The mustard growing areas in India are experiencing the vast diversity in the agro climatic conditions and different species of rapeseed-mustard are grown in some or other part of the country. Under marginal resource situation, cultivation of rapeseed-mustard becomes less remunerative to the farmers. This results in a big gap between requirement and production of mustard in India. Therefore, site-specific nutrient management through soil-test recommendation based should be adopted to improve upon the existing yield levels obtained at farmers field. Effective management of natural resources, integrated approach to plant-water, nutrient and pest management and extension of rapeseed-mustard cultivation to newer areas under different cropping systems will play a key role in further increasing and stabilizing the productivity and production of rapeseed-mustard. The paper reviews the advances in proper land and seedbed preparation, optimum seed and sowing, planting technique, crop geometry, plant canopy, appropriate cropping system, integrated nutrient management and so forth to meet the ever growing demand of oil in the country and to realize the goal of production of 24 million tonnes of oilseed by 2020 AD through these advanced management techniques.

Mustard is cultivated in mostly under temperate climates. It is also grown in certain tropical and subtropical regions as a cold weather crop. Indian mustard is reported to tolerate annual precipitation of 500 to 4200 mm, annual temperature of 6 to 27°C, and pH of 4.3 to

JUST AGRICULTURE
multidisciplinary e-Newsletter

8.3. Rapeseed-mustard follows C_3 pathway for carbon assimilation. Therefore, it has efficient photosynthetic response at 15–20°C temperature. At this temperature the plant achieve maximum CO_2 exchange range which declines thereafter. *Rai* is mostly grown as a rainfed crop, moderately tolerant to soil acidity, preferring a pH from 5.5 to 6.8 thrives in areas with hot days and cool night and can fairly sustain drought. Mustard requires well-drained sandy loam soil.

Rapeseed-mustard has a low water requirement (240–400 mm) which fits well in the rainfed cropping systems. Nearly 20% area under these crops is rainfed. A review is prepared on advances on agronomic practices for enhancing the rapeseed-mustard production in India. A review of the work done on the different aspects in India and abroad especially under advance agronomic practices is done in this paper.

Planting Technique

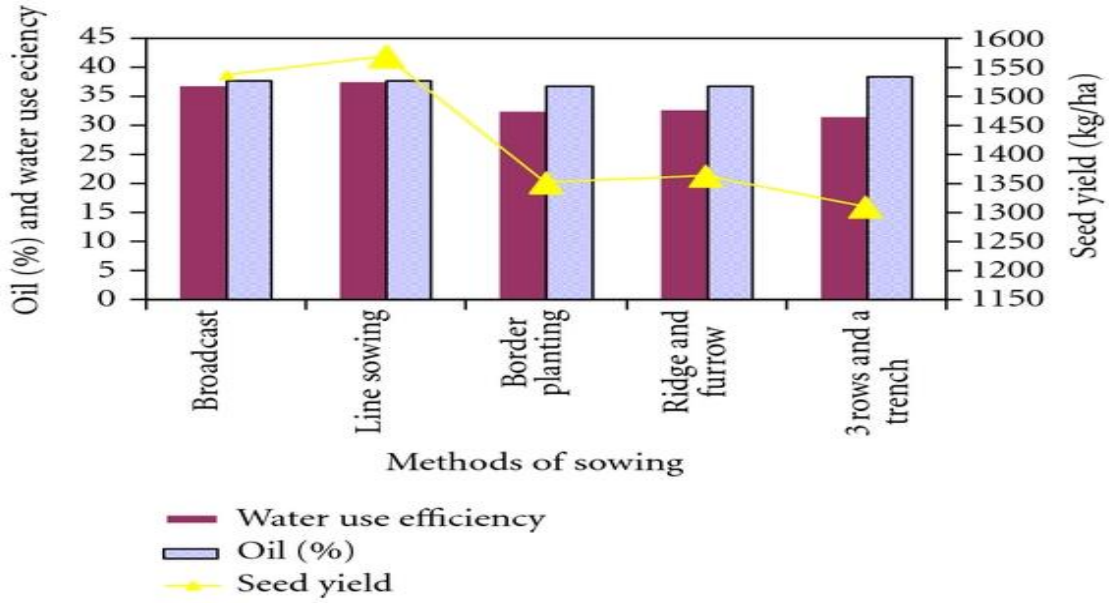
Sowing technique depends upon land resources, soil condition, and level of management and thus broadcast, line sowing, ridge and furrow method and broad bed and furrow method are common sowing techniques. At higher soil moisture regimes, broadcasting followed by light planking gives early emergence and growth. Under normal and conserved moisture regime, seed placement in moist horizon under line sowing becomes beneficial.

At Shillongani, broadcast method was found to be more successful. Significantly higher seed yield of *toria (Brassica rapa var. toria)* was harvested in broadcast sowing of *toria* over other practices. *Toria* broadcast at dough stage along with 80 kg N/ha gave the highest yield (AICRP-RM, 2006). At Bhubaneshwar, line sowing of yellow sarson after land preparation produced maximum seed yield (870 kg/ha) with 40 kg N/ha. At Behrampore, 40% higher seed yield of *toria* was obtained when sown in line after land preparation in the rice-based cropping system over broadcast (AICRP on RM, 2006). *Paira* or *utera* is a method of *cropping* in which the sowing of next crop is done in the standing previous crop without any tillage operation. Mustard sowing under *paira*/*utera* in the rice field has shown its edge over line sowing and broadcasting (Sowing of seeds by broad casting the seeds in the field) in eastern parts of India. At Dholi, mustard sown with *paira* cropping recorded significantly higher seed yield (1212 kg/ha) over line sown and broadcast method, while these 2 methods

JUST AGRICULTURE
multidisciplinary e-Newsletter

yielded at par. At Bhubaneswar, significantly higher yield (887 kg/ha) of mustard was recorded when sown as *utera* crop over line and broadcast sown crop.

Ridge and furrow sowing was superior to conventional flat sowing for growth parameters and yield of *Brassica juncea*. Under saline condition, seed yield of canola in ridge sowing was higher by 45, 31, and 28% than broadcast, drill and furrow sowing methods, respectively. The highest yield was associated with less saline environment at the ridges which allowed the seed to germinate and increase the yield. Transplanting of mustard has also been reported thereby saving time, and resources. Transplanting reduces days to maturity and results in higher seed yield. Ridge transplanting reduced water applied by 30% for each furrow as compared to 45 cm row spacing in flat method without any loss in seed yield. The corresponding increase in water use efficiency (WUE) was 27%. In bed planting, there was a 35% saving in water resulting in 32% increase in WUE.



Impact of low monetary Agro techniques on mustered productivity

Agricultural inputs like fertilizer, irrigation, insecticides, pesticides, and herbicides, and so forth, are very expensive. Some nonmonetary or low monetary inputs can enhance the yield considerably with a slight increase in the cost of cultivation. There are a number of low monetary agro techniques which enhance the mustard yield considerably. For harvesting the maximum yield of rapeseed-mustard at a given situation, all the production technologies,

JUST AGRICULTURE
multidisciplinary e-Newsletter

like, soil amendments, thinning, nutrient supply, sowing direction, irrigation, plant protection, and so forth should be planned well in advance. At Bharatpur, highest seed yield (1464 kg/ha) was recorded with the application of recommended practice (RP) + thinning at 15 and 25 DAS + detopping at bud-initiation stage followed by RP + thinning at 15 and 25 DAS.

Future line of research

Rapeseed-mustard will continue to contribute considerably to the oilseed bowl of the country. A streamlined research programme for rapeseed-mustard should be focused on the below-mentioned points. (i) Horizontal and vertical intensification in rapeseed-mustard production needs to be done for self-sufficiency in oilseed production. It is possible through varietal improvement and introduction of mustard in nontraditional areas.(ii)An optimum agronomic package of practices for high yielding and insect, pest, and disease resistant varieties, along with the upcoming hybrids needs to be worked out.(iii)Adoption of site-specific nutrient management (SSNM), precision agriculture, and conservation agriculture can bring more profits to the mustard growers.(iv)An integrated weed management approach needs to be developed for problematic and parasitic weeds in mustard. *Orobanche* is becoming a serious constraint and for its management a holistic approach which includes GM techniques needs to be explored. (v)Suitable crop models and simulation for various inputs like water and nutrients will be helpful to target the most productive and most potential mustard growing zones of India.

Conclusion

The tremendous increase in oilseed production is attributed to the development of high yielding varieties coupled with improved production technology, their widespread adoption and good support price. To meet the ever-growing demand of oil in the country, the gap is to be bridged through management techniques. The vertical growth in mustard production can be brought by exploiting the available genetic resources with breeding and biotechnological tools which will break the yield barriers. Horizontal growth in rapeseed-mustard can be brought in those rapeseed-mustard growing areas/districts of the country, wherever, the yield is lower than the national average. Production technologies for different agro ecological cropping systems, crop growing situations like intercropping, salinity, rainfall, and so forth, under unutilized farm situations like rice-fallows, mustard to be

JUST AGRICULTURE
multidisciplinary e-Newsletter

followed after cotton, sugarcane, soybean, and so forth, and mustard as a *paira* crop in rice with lathyrus, lentil or any other competing *rabi* crop in traditional and nontraditional areas, need to be worked out. It is estimated that at least 1 million hectares can be brought under cultivation, through adoption of such cropping systems.

Proper land preparation, proper time of sowing, selection of better quality seeds, and so forth are always neglected. Fertilizer application is little or nonexistent leading to poor productivity. Whether little is spent on fertilizer input goes entirely on nitrogenous fertilizers. This results in a big gap between requirement and production of mustard in India. Therefore, site-specific nutrient management through soil-test recommendation based should be adopted to improve upon the existing yield levels obtained at farmers field. Optimum crop geometry, balanced NPK fertilizers, intercultural operations, and inclusion of farmyard manure are the building blocks for achieving the utmost yield targets of rapeseed-mustard. Effective management of natural resources, integrated approach to plant-water, nutrient and pest management and extension of rapeseed-mustard cultivation to newer areas under different cropping systems will play a key role in further increasing and stabilizing the productivity and production of rapeseed-mustard to realize 24 million tonnes of oilseed by 2020 AD.

References

Directorate of Economics and Statistics, *Agricultural Statistics at a Glance*, Department of Agricultural and cooperation. Ministary of Agriculture, Government of India, 2010.

J. S. Chauhan, K. H. Singh, and A. Kumar, "Compendium of Rapeseed-mustard varieties notified in India," Directorate of Rapeseed-Mustard Research, Bharatpur, Rajasthan, pp. 7–13, 2006.View at: Google Scholar

M. A. Asoodari, A. R. Barzegar, and A. R. Eftekhar, "Effect of different tillage and rotation on crop performance," *International Journal of Agrcultural Biology*, vol. 3, no. 4, article 476, 2001.View at: Google Scholar

A. L. Rathore, A. R. Pal, and K. K. Sahu, "Tillage and mulching effects on water use, root growth and yield of rainfed mustard and chickpea grown after lowland rice," *Journal of Science of Food and Agriculture*, vol. 78, no. 2, pp. 149–161, 1999.View at: Google Scholar

AICRP-RM, Annual Progress Report of National Research Centre on Rapeseed-mustard.2002-2003, pp. 11–14, 2003.

T. Nagra, R. E. Phillip, and J. E. Legett, "Diffusion and mass flow of nitrate-N into corn roots under field conditions," *Agronomy Journal*, vol. 68, pp. 67–72, 1976.View at: Google Scholar

R. L. Blevins, M. S. Smith, and G. W. Thomas, "Change in soil properties under no tillage," in *No Tillage Agriculture*, pp. 190–230, New York, NY, USA, 1984.View at: Google Scholar

S. Snapp, R. Price, and M. Morton, "Seed priming of winter annual cover crops improves germination and emergence," *Agronomy Journal*, vol. 100, no. 5, pp. 1506–1510, 2008.View at: Publisher Site | Google Scholar

N. A. Khan and S.O. Aziz, "Response of mustard to seed treatment with pyridioxine and basal and foliar application of nitrogen and phosphorus," *Journal of Plant Nutrition*, vol. 16, no. 9, pp. 1651–1659, 1993.View at: Google Scholar