



Assessment of Irrigation Scheduling and Nipping Management for Higher Yield and Economic Returns of Mustard in Satpura and Kaymore Plateau Zone of Madhya Pradesh

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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ABSTRACT

On-farm testing was conducted for two consecutive years during Rabi seasons 2018-19 and 2019-20 at farmer's fields of Majhgawan block of Satna district in India to validate the effect of irrigation scheduling and nipping management for higher yield and economic returns of mustard. The on-farm testing trials were laid out with two treatments i.e T₁ Two irrigation (25 DAS and 40-45 DAS) and no nipping and T₂ Application of two irrigation (one each at pre-flowering 35-40 days and pod filling 65-75 days) and nipping at pre bud stage (30 DAS). Application of two irrigation (one each at pre-flowering 35-40 days and pod filling 65-75 days) and nipping at pre bud stage (30 DAS) recorded highest primary branches (13.95) and secondary branches (27.85) per plant, siliquae/plant (189.15), seeds/siliqua (19.30) seed yield (23.59 q ha⁻¹), gross returns (Rs 101721ha⁻¹), net return (Rs 71746ha⁻¹) and B:C ratio (3.39) as compared to application of two irrigation (25 DAS and 40-45 DAS) and no nipping. Two irrigations at pre-flowering and pod filling with nipping at pre bud stage (30 DAS) increase in plant growth and yield parameters so it can be recommended two irrigations at pre flowering and pod filling stage with nipping at pre bud stage for getting higher yield of Mustard over non-nipping in the Satpura and Kaymore Plateau zone of Madhya Pradesh.

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1. INTRODUCTION

Indian mustard (*Brassica juncea* L.) is the principal oilseed crop of Madhya Pradesh. It occupied an area of 6.23 million hectares and produced 9.34 million tonnes annually with an average productivity of 1499 kg ha⁻¹ of country. In Madhya Pradesh, rapeseed and mustard is grown in 0.78 million hectares area with an annual production of 1.11 million tones and average productivity of 1422 kg ha⁻¹ [1]. Physiological manipulations may influence the plant source to sink relationship and ultimately yield.

There is a need to explore the advantage of simple agro techniques like nipping, which suppresses the apical dominance and facilitates more lateral branches, ultimately resulting in more siliqua/plant and yield [2]. Timely scheduling of irrigation increases the availability of water and nutrients by creating a favorable soil moisture regime and nipping of mustard increases the number of branches and thus increases the productivity of Mustard by 25 %. There are reports on the advantage of nipping in soybean, castor, chickpea and sunflower, however, so far not much research work has been done in Indian mustard. Therefore, on-farm testing was undertaken with the following objectives to find out the effect of irrigation scheduling and nipping management in productivity and profitability of Mustard. Nipping in mustard is one of the important parameters for the enhancement of the growth and yield contributing parameters.

2. MATERIALS AND METHODS

The study was undertaken in the farmer's fields of Satna district as On-farm testing programme by Krishi Vigyan Kendra, Satna, Madhya

Pradesh, India during two consecutive years Rabi 2018-19 and 2019-20.

2.1 Problem Diagnosis

Low productivity and profitability of rice/blackgram-mustard cropping system.

2.2 Selection of Farmers

Krishi Vigyan Kendra Satna has arranged a meeting cum training programme for the farmers who got less yield from rice/black gram-mustard cropping system during the year Rabi 2017-18. They were made awareness about irrigation schedule, nipping management and common practices for higher mustard yield and profitability. 10 farmers were selected from these trainees for on-farm testing on assessment of irrigation scheduling and nipping management for higher yield and economic returns in mustard.

In addition to the training, they were given details of laying out of experiment, practices to be followed and how to take observation as a printed instruction sheet.

2.3 About Experimental Site

Geographically Satna is situated in the Satpura and Kaymore Plateau range and lies at 24° 51' 15" to 24° 57' 30" N latitude and 80° 43' 30" to 80° 54' 15" E longitude at the elevation of 313 m from the mean sea level. The location has a subtropical climate characterized by hot dry summer and cool winter. The soil of the farmer's fields was sandy loam in texture with shallow in depth and soil was very low in available nitrogen, low in available phosphorus and higher in available potassium. Soil reaction was almost neutral.



Fig. 1. Nipping in mustard at pre bud stage (30 DAS)

2.4 Treatments

The on-farm testing trials were laid out with two treatments i.e T₁ Two irrigation (25 DAS and 40-45 DAS) and no nipping, T₂ Application of two irrigation (one each at pre-flowering 35-40 days and pod filling 65-75 days) and nipping at pre bud stage (30 DAS) on 10 farmers' fields considering each field as separate replication.

2.5 Imposition of Treatment

Nipping was done by plucking the apical bud at 30 DAS with the help of a sharp blade.

2.6 Package of Practices Followed

Mustard variety 'Giriraj' was sown during the first week of November during the year 2018-19 and 2019-20 and sowing was done after harvesting of paddy followed by pre-sowing irrigation and 3-4 cultivation after getting workable field condition. The Mustard crop was sown in spacing, 45×12 cm and drilling of seed (5 kg ha⁻¹) by seed cum ferti drill with the full dose of Single Supper phosphate (250 kg ha⁻¹), and mureate of potash (50 kg ha⁻¹) and half dose of urea (87 kg ha⁻¹) was applied at a time of sowing and the remaining dose of nitrogen was applied

remaining half dose of urea (87 kg ha⁻¹) through top dressing after first irrigation at the appropriate moisture level in fields.

2.7 Observations Record

Five plants from the sampling rows were uprooted and used to compute the biometric and yield observations.

2.8 Analysis

In economic analysis, the cost of cultivation was worked out taking into account the prevailing labour and field operation charges in the locality, cost of inputs and the extra treatment costs in ha. The gross return was calculated on the local market prices of Mustard and expressed on per hectare basis.

Gross monetary returns (GMR): Based on the prices of output prevailing at the time of harvest, treatment-wise GMR (INR ha⁻¹) was computed.

Net monetary returns (NMR): Based on the current market price of inputs and outputs, the NMR (INR ha⁻¹) was worked out by using the following formula.

Net monetary returns (INR ha⁻¹)=[Gross monetary returns (INR ha⁻¹)]-[Total cost of cultivation (INR ha⁻¹)]

Benefit: cost ratio: It was calculated by using the formulae given below:

$$\text{Benefit: cost ratio} = \frac{\text{Gross monetary returns (INR ha}^{-1}\text{)}}{\text{Total cost of cultivation (INR ha}^{-1}\text{)}}$$

3. RESULTS AND DISCUSSION

3.1 Growth Parameters

The data (Table 1) showed that the T₂ Application of two irrigation (35-40 and 65-75 DAS) with nipping at pre bud stage (30 DAS) recorded lower plant height (191.40 cm) and higher primary branches (13.95) and secondary branches (27.85) per plant of mustard in over T₁-Two irrigation (25 DAS and 40-45 DAS) and no nipping. Arjun Sharma et al. [3] noticed the reduction in plant height and increase in the number of primary and secondary branches. Apical bud nipping is known to alter the source-sink relationship by arresting the vegetative growth and hastening the reproductive phase. It also helps in the production of more siliquae bearing branches thus, resulting in increased photosynthetic metabolic activity, accumulation of more photosynthates and metabolites, ultimately resulting in a better quality seed with higher seed yield. Similar results were also obtained by Thakral et al. [4] and Chaudhari et al. [2].

Table 1. Growth parameters influenced by irrigation scheduling and nipping management of mustard (average of two years)

Treatments	Plant height (cm)	Primary branches/plant	Secondary branches/plant
T ₁ Two irrigation (25 DAS and 40-45 DAS) and No nipping	196.65	10.25	26.35
T ₂ Application of two irrigation (one each at pre-flowering 35-40 days and pod filling 65-75 days) and nipping at pre bud stage (30 DAS)	191.40	13.95	27.85

3.2 Yield Attributes and Yield

The data (Table 2) revealed that the T₂-Application of two irrigation (one each at pre-flowering 35-40 days and pod filling 65-75 days) with nipping at pre bud stage (30 DAS) recorded highest siliquae/plant (189.15), Seeds/siliqua (19.30) and Seed yield (23.59 q ha⁻¹) as compared to T₁-Two irrigation (25 DAS and 40-45 DAS) and no nipping. An increase in the seed yield by nipping might be due to an increase in the number of productive branches, leaf thickness, number of siliquae per plant and number of seeds per siliqua. Similarly, an increase in yield due to nipping was also observed by Reddy [5] and

similar results were also obtained by Himayatullah et al. [6] and Aurangzeb et al. [7] respectively.

3.3 Economics of the Treatments

Data regarding economics of the treatments depicted in Table 3 indicated that the application of two irrigation (one each at pre-flowering 35-40 days and pod filling 65-75 days) with nipping at pre bud stage (30 DAS) recorded highest gross returns (Rs 101721 ha⁻¹), net return (Rs 71746 ha⁻¹) and B: C ratio (3.39) as compared to application of two irrigation (25 DAS and 40-45 DAS) and no nipping.

Table 2. Yield attributes and yield as influenced by irrigation scheduling and nipping management in mustard (average of two years)

Treatments	Siliquae/plant (no)	Seeds/Siliqua (no)	Test weight (g)	Seed Yield (q ha ⁻¹)
T ₁ Two irrigation (25 DAS and 40-45 DAS) and No nipping	162.65	18.20	5.85	18.63
T ₂ Application of two irrigation (one each at pre-flowering 35-40 days and pod filling 65-75 days) and nipping at pre bud stage (30 DAS)	189.15	19.30	6.10	23.59

Table 3. Economics influenced by irrigation scheduling and nipping management of mustard (average of two years)

Treatments	Cost of cultivation (Rs ha ⁻¹)	Gross Monetary Returns (Rs ha ⁻¹)	Net Monetary Return (Rs ha ⁻¹)	B: C ratio
T ₁ Two irrigation (25 DAS and 40-45 DAS) and No nipping	28855	80357	51502	2.78
T ₂ Application of two irrigation (one each at pre-flowering 35-40 days and pod filling 65-75 days) and nipping at pre bud stage (30 DAS)	29975	101721	71746	3.39

4. CONCLUSION

Based on these findings, two irrigations at pre-flowering and pod filling with nipping at pre bud stage (30 DAS) increase in plant growth and yield parameters so it can be recommended for getting higher yield of Mustard over Two irrigation (25 DAS and 40-45 DAS) and no nipping

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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