



Effect of Moisture Conservation Practices on, Yield Attributes, Yield and Quality of Indian Mustard [*Brassica juncea* (L.) Czern&Coss]

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Authors' contributions:

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

Article Information

DOI: 10.9734/IJPSS/2023/v35i224136

Open Peer Review History:

This journal follows the Advanced Open Peer Review policy. Identity of the Reviewers, Editor(s) and additional Reviewers, peer review comments, different versions of the manuscript, comments of the editors, etc are available here:

<https://www.sdiarticle5.com/review-history/108536>

Original Research Article

Received: 12/09/2023

Accepted: 18/11/2023

Published: 22/11/2023

ABSTRACT

A field experiment was carried out during two consecutive years (2016-17 and 2017-18) at Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyala, Chitrakoot, Satna,(M.P.). Indiato evaluate the effect of moisture conservation practices on growth, yield attributes and yield of mustard under rainfed condition. Treatment consisted four moisture conservation practices i.e. no irrigation, life

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saving irrigation, straw mulch (Paddy straw @ 4t/ha) and kaolin 5 % spray. Result revealed that on pooled basis the tallest plant of 195 cm was recorded under life saving irrigation but number of branches (6.82) and dry weight per plant (39.8 cm) were significantly maximum in straw mulch treatment. The yield attributes such as siliqua per plant (298.5), seeds/siliqua (15.9), siliqua length (3.97 cm), seed weight per plant (17.06 g) and 1000- seed weight (5.57 g) were significantly superior under straw mulch followed by life saving irrigation. Significantly highest seed yield (2558 kg/ha), oil content (42.0 %) and protein content (20.5%) were obtained under straw mulch treatment while numerical enhancement was observed in life saving irrigation and kaolin 5% spray over no irrigation.

Keywords: Straw mulch; kaolin; yield attributes; yield; life saving irrigation.

1. INTRODUCTION

India is one of the major oil seed producing country in the world. Oil seed is major group of crop where in Govt. of India is giving importance to enhance their production mainly due to avoid heavy import bill on edible oils. The gap between the supply and demand has been created due to increasing population, improvement in living standard of people and stagnation in production of crops. Among oil seed crops, Rape seed – mustard is most important *rabi* season crop comprising seven different species viz. Indian mustard, toria, yellow sarson, brown sarson, gobhisarson, karanrai and taramira. The estimated area, production and average yield of mustard in the world was 36.68 million hectares, 72.42 million tonnes and average yield 1974 kg/ha during 2017 -18. During all last seven years there has been a considerable increase in productivity from 1840 kg/ha in 2010 -11 to 1974 kg/ha in 2017 -18 and production has also increased from 61.64 mt. in 2010 to 72.42 mt. in 2017 -18 [1]. In India rapeseed – mustard is grown over an area of 6.07 mha, was a corresponding production of 7.92 mt and average production is 1304 kg/ha during 2016-17. In India Madhya Pradesh is one of the important rapeseed–mustard growing state after Rajasthan and Uttar Pradesh having an area of 1.52 mha with corresponding production of 3.28mt and average yield of 2175 kg/ha in 2018–19 [1]. Rapeseed – mustard is mostly gram under rainfed condition. Under such situation mustard crop suffer from soil moisture deficit which after crop growth and yield adversely. Soil moisture is lost due to evapotranspiration. Plants contain about 90-95 % water photosynthesis takes place in the presence of water, plant absorb nutrient through soil solution. The growth of microorganism was done through soil moisture. Straw mulch prevents direct evaporation of moisture from soil, reduced weed growth, control of temperature fluctuations and improved soil

condition. spraying of anti –transparent like kaolin can go away in economizing water and making it more available to the plant for growth and seed production. In the present situation, strategies to combat the drought through different chemicals like CaCl₂, Pusa hydrogel, kaolin 5% spray and practices like organic mulching may be beneficial. Under severe moisture stress condition, lifesaving irrigation was found the most important practices to boost the yield of mustard.

Thus with consideration of these views, present investigation was under taken.

2. MATERIALS AND METHODS

The present field experiment was conducted during *rabi* season of 2016-17 and 2017-18 at Mahatma Gandhi Chitrakoot Gramodaya Vishwavidyala, Chitrakoot, Satna (M.P.). Treatment consisted four moisture conservation practices viz. No irrigation, life saving irrigation, no irrigation + straw mulch of paddy @ 4t/ha, no irrigation + kaolin 5 % spray at 35DAS stage. Thus four treatments were tried in three replicated randomized block design. The soil of experimental plot was sandy loam in texture having soil pH 7.6, organic carbon 0.51 %, available nitrogen 168 kg/ha, available phosphorous 17.8 kg/ha and available potassium 350 kg/ha. The mustard crop (v. Pusamahak) was sown on 02 November 2016 and 03 November 2017 at distance to 45 cm in furrows. After 15 DAS plant spacing was maintained 15 cm through manual thinning operation. Crop was fertilized @ 120 kg N + 60 kg P₂O₅ + 30 kg K₂O/ha through urea, DAP and murate of potash, respectively. Half quantity of N + full quantity of P₂O₅ and K₂O was basally applied at sowing and remaining half n by topdressing after 30 DAS in T₁: irrigation was not given, in T₂ one irrigation was given at 35 DAS, in T₃ straw mulch of paddy

@ 4t/ha was spread 30 DAS of crop in plot and in T₄ kaolin 5 % spray at 35 DAS. Remaining all the package of practices was adopted as per recordation of crop. The crop was harvested on 01 April 2017 and 05 April 2018. The growth parameters viz. plant height, number of branches and dry weight / plant were recorded at 50 DAS. Yield attributes and yields were recorded at harvest and threshing of crop. The oil content in seed of mustard directly analysed by NIR (Near Infrared Reflectance) [2]. Protein was computed by multiplying the N-content of seed with a factor of 6.25. The total N content was determined by an adopting modified kjeldals method.

3. RESULTS AND DISCUSSION

3.1 Growth Parameters

Plant height, number of branches and dry weight (Table 1) per plant were significantly differed with moisture conservation practices during both years and in pooled. Life saving irrigation treatment produced significantly tallest plant (195.6 cm) than no irrigation, straw mulch and kaolin 5 % spray. The formation of branches /plant and dry weight /plant were significantly maximum under straw mulch treatment (6.82 branches and 39.8 g dry weight) than no irrigation and atpar to remaining treatments on pooled basis as well as year wise . On pooled basis, life saving irrigation, straw mulch and kaolin 5 % spray improve dry weight / plant by 1.5 g, 4.9g and 0.8 g /plant over control, respectively. The increasement in life saving irrigation was due beneficial effect of irrigation on growth of crop, straw mulch due to check evaporation from soil and reduced weed density and maintains soil temperature while kaolin 5 % spray reduced transpiration of water from leaf reported similar findings [3].

3.2 Yield Attributes

It is evident from table -2 that yield attributes of mustard such as number of siliqua / plant , number of seeds / siliqua , length of siliqual, seed weight / plant and 1000 –seed weight were significantly varied with moisture conservation practices during 2016-17, 2017-18 and in pooled. On pooled basis, the highest siliqua / plant (298.5), seeds/ siliqua (15.9), siliqua length

(3.97cm) seed weight /plant (17.06g) and 1000-grain weight (5.57g) were found under straw mulch treatment than no irrigation. It was attributed due to growth parameters particularly in dry weight/plant. Role of moisture conservation practices already mentioned above. [4], [3] and [5] corroborated these findings. Numerical enhancement on yield attributes of mustard was observed in life saving irrigation and kaolin 5 % spray over no irrigation.

3.3 Yields and Harvest Index

The grain yield, stover yield and harvest index were found significantly maximum under straw mulch treatment during both years of experimentation and in pooled. On pooled value basis life saving irrigation, straw mulch and kaolin 5 % spray increased grain yield by a margin of 94 kg or 4.19 %, 312 kg or 13.89 % and 47 kg /ha or 2.09 % as well as stover yield by 198 kg (4.18 %) , 659kg (13.90 %) and 99 kg (2.09 %) over no irrigation, respectively. The yield attributes and dry weight / plants were supported the findings of grain and stover yield. It was due to beneficial role of moisture conservation practices on growth and yield of mustard. Better growth parameter formed superior yield attributes as well as seed and stover yield. The trend of harvest index was similar to grain and stover yield. These results are in conformity with [6], [4],[3],[5] and [7].

3.4 Quality Parameters

It is obvious from table 3 that the oil and protein content in mustard seed were significantly influenced due to moisture conservation practices during both years and in pooled. Straw mulch treated plot had significantly maximum oil content (42.0 %) and protein content (20.5 %) on pooled basis. Remaining treatment enhanced oil and protein content numerically over no irrigation. It was probably due to moisture conservation practices formed bolder seeds and more uptake of nutrients (NPK) while no irrigation treatment formed small and shrinkled seed due to lower uptake of nutrients hence oil and protein content was poor. It was also supported by seed size (1000- seed weight in table (2). [8], [6] and [9,10,11] reported increased oil content in mustard seed with irrigation

Table. 1. Effect of cropping system and moisture conservation practices on plant height (cm), number of branches / plant and dry weight (g) at 50 DAS of mustard crop

Treatment	Plant height (cm) at 50 DAS			Branches / plant (number) at 50 DAS			Dry weight / plant of mustard (g) 50 DAS		
	2016- 2017	2017-2018	Pooled	2016- 2017	2017-2018	Pooled	2016- 2017	2017-2018	Pooled
Moisture Conservation Practices									
No Irrigation	178.2	181.7	179.9	5.76	6.22	5.99	33.6	36.3	34.9
Life Saving Irrigation	193.7	197.6	195.6	6.00	6.48	6.24	35.0	37.8	36.4
No Irrigation + Straw mulch	186.6	190.4	188.5	6.56	7.08	6.82	38.3	41.3	39.8
No Irrigation + kaolin 5 % spray	188.1	191.8	189.9	5.88	6.35	6.12	34.3	37.0	35.7
SEm ±	0.96	0.98	0.96	0.09	0.10	0.09	0.53	0.54	0.55
C.D. (P = 0.05)	2.82	2.90	2.82	0.27	0.29	0.28	1.56	1.68	1.62

Table. 2. Effect of moisture conservation practices on number of Silliqua, seeds per Silliqua, Silliqua length and 1000- seeds weight (g) of mustard

Treatment	Number of Silliqua/plant			Number of seeds/Silliqua			Silliqua/length (cm)			1000- seeds weight (g)		
	2016-17	2017-18	Pooled	2016-17	2017-18	Pooled	2016-17	2017-18	Pooled	2016-17	2017-18	Pooled
Moisture Conservation Practices												
No Irrigation	252.0	277.2	262.1	13.4	14.5	14.0	3.37	3.63	3.50	4.70	5.08	4.89
Life Saving Irrigation	262.5	283.5	273.0	14.0	15.1	14.6	3.50	3.80	3.65	4.90	5.29	5.10
No Irrigation + Straw mulch	287.0	310.0	298.5	15.3	16.5	15.9	3.80	4.13	3.97	5.36	5.79	5.57
No Irrigation + kaolin 5 % spray	257.3	277.8	267.5	13.7	14.8	14.3	3.43	3.70	3.57	4.80	5.19	4.99
SEm ±	4.56	4.92	4.74	0.21	0.23	0.22	0.05	0.06	0.05	0.08	0.09	0.09
C.D. (P = 0.05)	13.44	14.52	13.98	0.62	0.67	0.65	0.16	0.17	0.16	0.24	0.26	0.25

Table 3. Effect of moisture conservation practices on seed yield per plant (g), grain yield (kg/ha), stover yield (kg/ha), oil and protein content (%) in mustard (seed) crop

Moisture conservation practices	Seed yield/plant (g)			Grain yield (kg/ha)			Stover yield (kg/ha)			Harvest index			Oil content in seed (%)			Protein content in seed		
	2016-17	2017-18	Pooled	2016-17	2017-18	Pooled	2016-17	2017-18	Pooled	2016-17	2017-18	Pooled	2016-17	2017-18	Pooled	2016-17	2017-18	Pooled
No irrigation	14.40	15.15	14.98	2160	2333	2246	4560	4925	4742	28.8	31.1	30.0	40.2	41.0	40.6	19.6	20.0	19.8
Life saving irrigation	15.00	16.20	15.60	2250	3430	2340	4750	5130	4940	30.0	32.4	31.2	40.8	41.6	41.2	19.9	20.3	20.1
Straw mulch	16.40	17.71	17.06	2460	2657	2558	5193	5609	5401	32.0	35.4	34.1	41.6	42.4	42.0	20.3	20.7	20.5
Kaolin 5% spray	14.70	15.88	15.29	2205	2381	2293	4655	5027	4841	29.4	31.8	30.6	40.6	41.4	41.0	19.8	20.2	20.0
S.E.M. ±	0.23	0.24	0.24	34	37	18	72	77	47	0.45	0.49	0.47	0.16	0.16	0.16	0.08	0.08	0.08
C.D.(P=0.05)	0.67	0.72	0.69	100	108	53	211	288	220	1.33	1.44	1.39	0.48	0.48	0.48	0.23	0.24	0.24

4. CONCLUSION

Concluded that All moisture conservation practice performed better growth, yield attributes and yield of mustard as compared to no irrigation in all cropping system. Use of straw mulch produced maximum branches/plant (6.82), dry weight/plant (39.8g), Silliqua /plant (298.5). Seed /Silliqua (15.9), 1000-seed weight (5.57 g), seed weight/plant (17.06 g) and seed yield of mustard (2558 kg/ha) of mustard for Kymore Plateau region of Madhya Pradesh.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

REFERENCES

1. Anonymous Annual Progress Report of AICRP on Oilseeds (Rapeseed-Mustard) Publisher- RVSKVV-ZARS, Morena.422201;2020.
2. AOAC Official methods of analysis. Association of Official Analytical Chemists, Arlington.402330; 1990.
3. Awasthi UD, Singh RB and Dubey AB. Effect of sowing date and moisture conservation practices on growth and yield of Indian mustard (*Brassica juncea*). Indian Journal of Agronomy. 2007;52(2):151-153.
4. Ragar PL, Rao SS and Joshi NL. Effect of in – situ moisture conservation practices in productivity of rainfed Indian mustard (*Brassica juncea*). Indian Journal of Agronomy. 2007;52(2):149–150.
5. Kumar, Krishna, Kumar, Yogeshand Katiyar, Nirmal Kumar. Effect of plant geometry, nitrogen level and antitranspiration on physiological growth, yield attributes, WUE and Economics of mustard (*Brassica juncea*) under semi- arid conditions of western Uttar Pradesh. Journal of Pharmacognosy and Photochemistry. 2018;7(2):226 -229.
6. Singh, Teekam, Rana, KS. Effect of moisture conservation and fertility on Indian mustard (*Brassica juncea*) and lentil (*Lens culinaris*) intercropping system under rainfed conditions. Indian Journal of Agronomy. 2006;51(4):267–270.
7. Tomboli YA, Yadav JS, Kumar and Parveen, Dahiya, Rita and Kumar, Anil. Growth and phenological responses of Indian mustard (*Brassica juncea*L.) to different irrigation levels, varieties and antitranspiration. The Pharma Innovation Journal. 2021;10(7):920-926.
8. Bhalerao PD. Effect of irrigation and nitrogen on Indian mustard (*Brassica juncea*) varieties in Vidharbha region. Indian Journal of Agronomy. 2001; 46(4):727–731.
9. Chauhan DR, Ram, Mangat and Singh, Ishwar. Response of Indian mustard to irrigation and fertilization with various sources and levels of sulphur. Indian Journal of Agronomy. 2002;47(3):422 – 426.
10. Agarwal SK and De R. Effect of straw mulch and antitranspirant on soil and leaf temperature, relative leaf water content and canopy reflectivity of barley (*Hordeumvulgare*L.) varieties grown under dryland conditions. Indian Journal of Plant Physiology. 1976;19:60-65.
11. Singh, Jagdev, Singh, Bihram and Yadav JS. Effect of irrigation on Indian mustard (*Brassica juncea*) sown on conserved moisture. Indian Journal of Agronomy. 2001;46(4):721–726.

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