Int.J.Curr.Microbiol.App.Sci (2023) *12*(01): 190-195

International Journal of Current Microbiology and Applied Sciences
***ISSN: 2319-7706* Volume 12 Number 1 (2023)**
Journal homepage: http://www.ijcmas.com

Original Research Article https://doi.org/10.20546/ijcmas.2023.1201.021

Monitoring the Yield and Biomass Production of Pusa Bold Variety in New Alluvial Zone

Palden Lama, Udita Mondal* and N. C. Das

Department of Soil and Water Conservation, Bidhan Chandra Krishi Viswavidyalaya, India

**Corresponding author*

Keywords

Indian mustard, oil crops, animal oil, *Brassica juncea* sp, groundnut

Article Info

Received:
14 December 2022
Accepted:
31 December 2022
Available Online:
10 January 2023

A B S T R A C T

An one year field experiment was carried out in Instructional Farm, Bidhan Chandra Krishi Viswavidyalaya, Mondouri, Nadia, West Bengal, India during *rabi* season of 2017 to find out the yield and yield attributes of different irrigation and nutrient management of var. Pusa Bold. The experimentation was laid out in split plot design with irrigation in the main plot and fertiliser doses in subplots. At harvest, irrigation levels significantly influenced plant height. Three post-sowing irrigations viz. one irrigation at 30 DAS (I_1), one irrigation at 60 DAS (I_2) and two irrigations at 30 and 60 DAS (I_3), three nutrient treatments viz. No fertiliser or manure (F_0), 100% recommended NPK *i.e.* 80kg N, 40 kg P and 40 kg K ha^{-1} (F_1) and 100% recommended NPK plus fresh cow dung slurry (FCS) @10,000 lit ha^{-1} (F_2) were tested in a split plot design. Biomass production was significantly greater in I_3 than I_1 and I_2, and in F_2 than F_1 and F_0. The I_3 x F_2, I_1 x F_2 and I_3 x F_1 combinations maintained significantly greater plant height and yield components. Number of siliqua per plant and seeds per siliqua were the major contributors to the seed yield. The crop yield was the highest in I_3XF_2 combinations, and the similar yield was obtained in I_1XF_2 and I_3XF_1 combinations. Application of organic manure *in the form of fresh cow dung slurry (FCS)* with 100% NPK fertilisers produced greater plant height, crop growth rate, biomass production and yield attributes and saved one post sowing irrigation. Increasing dry matter accumulation with nutrient management was observed over control at this stage. F_2 (Full dose of NPK + FCS) gave the best result which was statically at par with F_1 (Full dose of NPK).Interaction effect was found to be significant at this stage i.e. $I_3 \times F_2$ was found with best result. The lowest value was recorded with $I_2 \times F_0$.

Introduction

Indian mustard (*Brassica juncea* sp.) is one of the most important oil crops which constitutes important component of human diet and superior to animal oil (Alam *et al.*, 2015). Presently rapeseed mustard sown area in India is 6.36 mha, with a production of 8.03 mt. About 13.2 percent of the annual world edible oil supply comes from this species (FAO, 2007). Amongst important high remunerative crops and source of edible oil grown in the country, rapeseed and mustard occupy the second place in terms of average production after groundnut and for these reasons several hybrid varieties should be cultivated, which can yield better with high inputs of fertilizers, irrigation levels and suitable dates for

sowing and good management practices. Sowing time is one of the most important nonmonetary input which impacts the yield and oil to a great extent (Pavlista *et al.*, 2011).

Materials and Methods

Study site and experimental setup

The present experiment was laid out in *rabi* season of 2017 in humid subtropical region of West Bengal. The effect of irrigation and nutrient management on growth and yield of mustard was studied effectively during this season. The venue of research was at the Instructional Farm, Bidhan Chandra Krishi Viswavidyalaya, Mondouri, Nadia. The farm falls under close proximity of the tropic of cancer having approximately $22^0$56' N latitude and $88^0$32' E longitude. The place is about 9.75 m above the mean sea level.

Experimental soil

The experimental soil was alluvial in nature (entisol) and clay-loam in texture with an average bulk density of 1.35. The pH was recorded to to be 6.2 with a CEC [c mol (p+) kg^{-1}] of 24.6 and EC (ds m^{-1}) of 0.104. Available N (kg ha^{-1}) was recorded as 393.54, Available p (kg ha^{-1}) as 52.6, Available k (kg ha^{-1}) as 154.0 and Available S (mg kg^{-1}) as 14.3.

Soil sampling and analysis

The soils were collected from different spots in the field which did not receive any lime or fertilizer recently. The particle sized distribution of soil was carried out by International Pipette method (Piper, 1966) to estimate the sand, silt and clay fractions in the soil. The USDA system of soil classification was used for determination of textural classes.

Soil samples were collected with a core sampler of known diameter and length and the soil cores were dried in oven at 105^0C for 24 hrs for determination of bulk density following the method given by Dastane (1972).

Experimental details

Layout of the experiment

The experiment was laid out in "split plot design" with 9 treatments which were replicated thrice. Individual plot size was 4m×3m with total no of 27 plots. Irrigation was kept in the main plot and fertilizer doses were kept at subplot. The treatments were: I_1, Irrigation at 30 DAS; I_2, Irrigation at 60 DAS; I_3, Irrigation both at 30 & 60 DAS ; F_0, No fertilizer; F_1,Full dose of NPK; F_2, Full dose of NPK + Fresh Cowdung Slurry (FCS). N, P, K and FCS were applied @ 80, 40, 40 kg ha^{-1} and 10000lt ha^{-1} respectively. The sources of fertilizer were urea, single super phosphate and muriate of potash.

Crop and Variety

The experiment was conducted with popular mustard cultivar "Pusa bold" which matures in 130-140 days. Plants were semi-spreading type and the seeds had an average test weight of 4g.

Agronomic practices

The heights of the plants were taken at different growth stages. Twenty plants were selected at random from each plot, tagged and their heights were taken by a meter scale and then the average height was calculated at different growth stages. The heights were taken by measuring the distance from ground level to tip of the top most leaf or growing bud. At harvesting the height was recorded up to the top of the panicle. From these heights mean heights were calculated.

First height was recorded on at 40 DAS, second height was measured at 75 DAS and third height was recorded at 110 DAS. The twenty randomly selected plants from destructive sampling (1m long row) were used to record the dry matter production at different crop growth stages. The sampled plants were separated into leaves, stems and reproductive parts. The samples were dried in a hot air oven at a temperature of 80°C to 90°C for 8 to 10 hours, still

constant weights were obtained. Summation of the weights of all these parts gave the total dry weight (actually the dry mass) in g per m^2 area.

Methods of recording yield and yield attribute

Twenty plants from each plot were taken at random after harvesting and the number of filled siliqua $plant^{-1}$ counted on the standing plant and was averaged. For each plot 20 siliqua were randomly selected and number of seeds in these siliqua after harvesting were counted and the average number of grains per pod was calculated. The plants per net plot were cut above the roots, dried and threshed very carefully so that no loss of seeds occurred. After harvesting, threshing, cleaning and drying, seed yield were recorded from each plot separately and later converted to kg ha^{-1}.

The data relating to growth, yield parameters, yield of crop and quality as well as other recording during the period of experimentation were statistically analyzed following analysis of variance method (Cochran and Cox, 1967; Gomez and Gomez, 1984; Panse and Sukhatme, 1985). The significance of difference for sources of variance was tested by error mean square by Fisher Snedecor's 'F' test at probability level of 0.05. For comparison of 'F' values and computation of critical difference (CD) at 5% level of significance, Fisher and Yates' tables were consulted.

Results and Discussion

At harvest, irrigation levels significantly influenced plant height. Plant height in case of I_3 (two irrigation at 30 DAS and 60 DAS) was highest and that in case of I_2 (one irrigation at 60 DAS) was lowest. The more moisture availability with two irrigations might enable the plant to grow taller than other moisture regimes at the time of harvest.

Similar result i.e. increase in plant height with increased level of irrigation was also found by Singh and Shrivastava (1986). Nutrient management also increased plant height significantly over control. F_2 (Full dose of NPK + FYM) gave the best result which was nearly statically at par with F_1 (Full dose of NPK). Similar result was also found by Mandal *et al.*, (2006). The interaction effect was also found significant i.e. $I_3 \times F_2$ was found with best result. The lowest value was recorded with $I_2 \times F_0$.

Total dry matter accumulation at harvest was significantly influenced by irrigation levels. At this stage, I_3 (two irrigation at 30 DAS and 60 DAS) gave highest dry matter accumulation which was significantly different from I_1 (one irrigation at 30 DAS) and I_2 (one irrigation at 60 DAS. This is owing to the fact that higher moisture availability increased the plant height resulting in more dry matter accumulation in plant. Increasing dry matter accumulation with nutrient management was observed over control at this stage. F_2 (Full dose of NPK + FCS) gave the best result which was statically at par with F_1 (Full dose of NPK). Interaction effect was found to be significant at this stage i.e. $I_3 \times F_2$ was found with best result. The lowest value was recorded with $I_2 \times F_0$.

Effect of Irrigation and Nutrient management on yield attributes of mustard

Irrigation had significant influence on number of siliqua per plant. Best result was obtained in case of I_3 (two irrigation at 30 DAS and 60 DAS) which was significantly different from other two moisture regimes. This is because of the fact that I_3 i.e. irrigation at both flower initiation (30 DAS) and siliqua formation stage (60 DAS) increased the siliqua number over I_1 (one irrigation at 30 DAS) by 12.38 (I_3-I_1) while I_3 increased the same over I_2 (one irrigation at 60 DAS) by nearly 39 (I_3-I_2) which was 3 times higher than the previous one.

Irrigation at siliqua development stage (60 DAS) is generally critical but in case of I_2 as the crop did not get irrigation up to 60 DAS, comparatively poor result was obtained in case of I_2. The result corroborate with the previous findings of Ghatak *et al.*, (1992).

Table.1 Effect of Irrigation and Nutrient management on plant height and total dry matter accumulation of mustard at Harvest

Irrigation / Nutrient	I_1	I_2	I_3	Mean	I_1	I_2	I_3	Mean
	Plant height(cm)				Total dry matter accumulation (gm^{-2})			
F_0	124.23	108.27	132.1	121.53	416.6	409.06	423.91	416.54
F_1	143.63	132.07	169.4	148.36	420.54	420.05	423.56	421.39
F_2	155.67	141.67	181.4	159.58	424.43	423.26	440.31	429.57
Mean	141.17	127.33	160.96		420.52	417.69	429.28	
	Irrigation	Nutrient	I × NM	NM × I	Irrigation	Nutrient	I × NM	NM × I
SEm ±	0.06	0.09	0.15	0.14	0.06	0.05	0.09	0.09
CD(P= 0.05)	0.23	0.27	0.46	0.44	0.22	0.16	0.27	0.31

Table.2 Effect of Irrigation and Nutrient management on yield and yield attributes of mustard at Harvest

Irrigation / Nutrient	I_1	I_2	I_3	Mean	I_1	I_2	I_3	Mean	I_1	I_2	I_3	Mean
	Siliqua $plant^{-1}$				Seeds $siliqua^{-1}$				yield kg ha^{-1}			
F_0	72.67	54.40	80.37	69.14	I_1	I_2	I_3	Mean	769.97	522.20	915.23	735.8
F_1	105.60	66.43	115.10	95.71	10.63	7.0	10.40	9.34	1249.07	773.13	1430.97	1151.06
F_2	111.27	86.33	131.20	109.6	11.90	10.20	12.20	11.43	1440.13	1023.03	1734.93	1399.36
Mean	96.51	69.05	108.89		12.17	12.10	13.47	12.58	1153.06	772.79	1360.38	
	Irrigation	Nutrient	I × NM	NM × I	11.56	9.76	12.02		Irrigation	Nutrient	I × NM	NM × I
SEm ±	0.07	0.05	0.08	0.10	Irrigation	Nutrient	I × NM	NM × I	0.05	0.06	0.10	0.10
CD(P= 0.05)	0.28	0.15	0.26	0.35	0.05	0.05	0.09	0.09	0.21	0.18	0.31	0.33

Nutrient management also obtained significant effect on number of siliqua per plant over control one i.e. F_0. Best result was obtained in case of F_2 (Full dose of NPK + FCS) which was significantly different from other level i.e. F_1 and obviously from control. Similar type of result has been reported by Mandal *et al.,* (2006). Interaction effect was found to be significant at this stage i.e. $I_3 \times F_2$ was found with best result. The lowest value was recorded with $I_2 \times F_0$. Irrigation levels significantly influenced number of seeds per siliqua. Best result was obtained in case of I_3 (two irrigations at 30 DAS and 60 DAS) which was significantly difference from I_1 (one irrigation at 30 DAS) and I_2 (one irrigation at 60 DAS). I_2 gave the lowest number of seeds per siliqua. I_3 gave 4 % and 23 % more seeds per siliqua over I_1 and I_2, respectively. Similar results were observed by Patel *et al.,* (2015). Nutrient management also obtained significant effect on number of siliqua per plant over control one i.e. F_0. Best result was obtained in case of F_2 (Full dose of NPK + FCS) which was significantly different from other level i.e. F_1 and obviously from control. Similar type of result has been reported by Mandal *et al.,* (2006). Interaction effect was found to be significant at this stage i.e. $I_3 \times F_2$ was found with best result. The lowest value was recorded with $I_2 \times F_0$. Application of two irrigation at 30 DAS and 60 DAS i.e. I_3 recorded significantly higher seed yield than one irrigation at 30 DAS i.e. I_1 and one irrigation at 60 DAS i.e. I_2. Result obtained in case of I_1 was also significantly different from that in case of I_2. However, I_3 increased seed yield by 18 % and 76 % over I_1 and I_2, respectively. This may be due to the cumulative effect of significant improvement in growth parameters and yield attributes as achieved in case of I_3. This is in conformity with the findings of Jat *et al.,* (2017). Seed yield increased significantly with the increase in the levels of nutrient. F_2 (Full dose of NPK + FCS) gave the best result which was significantly different from both F_0 (control) and F_1 (Full dose of NPK). F_2 and F_1 gave around 90 % and 56 % more seed yield over control i.e. F_0, respectively. Increase in seed yield with increased level of nutrient i.e. Full dose of NPK + FCS over Full dose of NPK was also reported by Mandal *et al.,* (2006). Increase in physiological parameters such as plant height and total dry matter accumulation and also yield attributes parameters like number of siliqua per plant and seeds per siliqua played important role in increasing size of sink i.e. seed yield through increased synthesis of photosynthates and their proper translocation from source to sink. Interaction effect was found to be significant at this stage i.e. $I_3 \times F_2$ was found with best result. The lowest value was recorded with $I_2 \times F_0$.

References

Alam, M. J., Ahmed, K. S., Mollah, M. R. A., Tareq, M. Z. and Alam, J. 2015. Effect of Planting Dates on the Yield of Mustard Seed. International Journal of Applied Science and Biotechnology, 3(4): 651-654, https://doi.org/10.3126/ijasbt.v3i4.13974

Cochran, W. G and Cox G. W. 1967. Experimental designs. John Willey & Sons, Inc, New York.

Dastane, N. G. 1972. A practical manual for water use research. Pune, India: Navbharat Publication Mandir.

FAO (Food and agricultural Organization). (2007). FAO Production year Book. Rome, Italy, 61, p.64.

Ghatak, S., Sounda, G. and Jana, P. K. 1992. Effect of irrigation and nitrogen on seed and oil content of Indian mustard (*Brassica juncea*). *Indian journal of Agricultural sciences*, 62(10): 664-668.

Gomez, K. A. and Gomez, A. A.1984. *Statistical Procedures for Agricultural Research*. 2nd Edn., Int. Rice Res. Inst., Los Banos, Philippines.

Jat, L. A., Prajapati K. P., Patel, B. K and Patel, P. J. 2017. Influence of NPK Levels on Performance of Indian Mustard (*Brassica juncea* L.) *International Journal of Current Microbiology and Applied Sciences*, 6(8):1986-1990 e https://doi.org/10.20546/ijcmas.2017.609.243

Mandal, K. G., Hati, K. M., Mishra, A. K. and Bandhyopadhyaya, K. K. 2006. Assessment of irrigation and nutrient effects on growth, yield and water use efficiency of Indian mustard (*Brassica juncea*) in central India. *Agriculture Water Management*, 85(3): 279-286. https://doi.org/10.1016/j.agwat.2006.05.004

Panse, V. G. and Sukhatme, P. V. 1985. Statistical Methods for Agricultural Workers. Indian Council of Agricultural Research Publication, 87-89.

Patel, R., Solanki, D. S., Gami, R. A. and Prajapati, P. K. 2015. Genetic study for seed yield and seed quality traits in Indian mustard [*Brassica juncea* L. Czern & Coss.]. *Electronic Journal of Plant Breeding*, 6(3): 672-679

Pavlista, A. D., Isbell, T. A., Baltensperger, D. D. and Hergert, G. W. 2011. Planting date and development of spring-seeded irrigated canola, brown mustard and camelina. Industrial Crops and Products 33: 451–456. https://doi.org/10.1016/j.indcrop.2010.10.029

Piper, C. S. 1966. Mechanical Analysis. Soil and Plant Analysis (Reprint for Asia). Hans Publishers, Mumbai.: 47 – 49.

Singh, B. N. and Shrivastava, S. P. 1986. Effect of irrigation and nitrogen fertilization on growth and yield of mustard in mid hills of Meghalaya. *Indian Journal of Agronomy*, 31(2): 135-138.

How to cite this article:

Palden Lama, Udita Mondal and Das, N. C. 2023. Monitoring the Yield and Biomass Production of Pusa Bold Variety in New Alluvial Zone. *Int.J.Curr.Microbiol.App.Sci.* 12(01): 190-195.
doi: https://doi.org/10.20546/ijcmas.2023.1201.021