International Journal of Environment and Climate Change

Volume 13, Issue 1, Page 117-123, 2023; Article no.IJECC.96718
ISSN: 2581-8627
(Past name: British Journal of Environment & Climate Change, Past ISSN: 2231–4784)

Effect of Irrigation Scheduling and Level of Nitrogen on Chandrasur (*Lepidium sativum Linn.*) in Zone III-B of Rajasthan, India

Nupur Sharma [a++*]

[a] *Krishi Vigyan Kendra, Sawaimadhopur, Agriculture University, Kota, India.*

Author's contribution

The sole author designed, analysed, interpreted and prepared the manuscript.

Article Information

DOI: 10.9734/IJECC/2023/v13i11641

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/96718

Original Research Article

Received: 28/10/2022
Accepted: 30/12/2022
Published: 06/02/2023

ABSTRACT

The present study was carried out to investigate the effect of irrigation and nitrogen levels on growth and yield of Chandrasur (*Lepidium sativum Linn.*) in two consecutive years Rabi 2018-19 and Rabi 2019-20 at Krishi Vigyan Kendra, Sawaimadhopur, Rajasthan. Results revealed that higher yield attributes No of branches plant^{-1}, Fresh weight at harvest (g plant^{-1}), 1000 seed weight (g), plant height (cm) were found significantly higher under three irrigation (25, 50 and 75 Days After Sowing) which was at par with two irrigations (25 & 50 Days After Sowing (DAS) and with 80 kg of N ha^{-1} which was at par with 60 kg N ha^{-1}. Under different level of irrigations application of three irrigation (25, 50 & 75 Days After Sowing (DAS) found higher seed yield (1593.34 kg ha^{-1}) which remained at par with two irrigation (25 & 50 DAS) compared to (one irrigation at 25 Days After Sowing), respectively. In sub plot treatments of different nitrogen levels Application of 80 kg of N ha^{-1} resulted in highest yield (1586 kg ha^{-1}) which was statistically at par with 60 kg of N ha^{-1} as compared to 40 & 20 kg N ha^{-1} respectively.

[++] *Subject matter Specialist (Agronomy);*
**Corresponding author: E-mail: nupurmahershi@gmail.com;*

Keywords: Chandrasur; garden cress; irrigation level; nitrogen level.

1. INTRODUCTION

Garden cress (*Lepidium Sativum*) is commonly known as Chandrasur. It is fast growing annual herb. It belongs to family Brasiccaceae. It is a medicinal plant which grows annually and equivalently distributed in India, United States, and Europe and cultivated in hot temperature climates across the world for many culinary and medicinal purposes. Its seeds are commonly called "Aliv" in Marathi, "Halim" and "Chandrasur" in Hindi and "Asali" in Malayalam [1]. Garden cress is rich source of Iron , folate , Carotenoids,Vit-A,Vit –C,Vit-E, Fiber, flavoinoids, selenium, sulfoxides and glucosinolates, Omega 3 fatty acids and other essential nutrients and phytochemicals. Nitrogen levels and Irrigation are the limiting factors in increasing the productivity of Chandrasur. It grows upto height of 15 to 45 cm and erect and glabrous. In India from ancient times garden cress has been used in traditional medicine, [2]. Its seeds are galactogogue, bitter, thermogenic, depurative, rubefacient, aphrodisiac, ophthalmic, antiscorbutic, antihistaminic, diuretic and act as tonic. Various diseases such as asthma, coughs with expectoration, diarrhea, dysentery, poultices for sprains, leprosy, skin diseases, splenomegaly, dyspepsia, lumbago, leucorrhoea, scurvy and seminal weakness can be treated using garden cress seeds, [3]. Garden cress seed has PUFA (poly unsaturated fatty acids) 46.8 % and MUFA (Mono unsaturated fatty acids) (37.6%) [4]. Chemical and nutritional composition of garden cress seeds contains protein (24±0.5), lipids (23.2 ± 0.2) carbohydrates (30.7 ± 1.2), fibre (11.9 ± 0.4) ash (7.1 ± 0.1) and moisture (2.9 ± 0.1) [5].

For higher agricultural production fertilization is the important input added externally. When it is not applied sufficiently it may cause significant reduction in Yield and quality. Water management is also a necessary agronomic practice which effects the yield of garden cress. According to Choudhary et al., 2022 garden cress has great medicinal importance which make its cultivation most important under changing climate scenario. Growth, dry matter accumulation and yield depends on variety and suitable dose of location specific fertilizers. According to Kumar et al., 2019 growth, oil yield, dry matter accumulation, nutrient uptake, seed yield all factors depends on irrigation, moisture conservation practices and fertilization. Vary less work has been done on this medicinal crop, garden cress. Therefore the present study was carried out to find out appropriate irrigation and nitrogen level for chandrasur (*Lepidium sativum Linn*.).

2. MATERIALS AND METHODS

A field experiment was conducted in the *rabi* season of 2018-19 & 2019-20 at krishi Vigyan Kendra, Sawaimadhopur under Zone III B. The experiment design was laid out into Split plot design and divided into Main and subplot which were replicated four times. Main plot consists of 3 irrigation levels one Irrigation (One at 25 DAS) (I_1), Two Irrigation (at 25 & 50 DAS) (I_2), & Three irrigation (25, 50 & 75 DAS) (I_3) and sub plot consists four different levels of nitrogen *i.e.* 20kg N ha^{-1}, 40kg N ha^{-1}, 60kg N ha^{-1} and 80kg N ha^{-1}. Dose of nitrogen were Applied in split doses half dose of nitrogen at the time of sowing and half at after first irrigation through urea. Full dose of phosphorus was applied through DAP as the basal application. Three irrigations were applied as per treatments. Source of irrigation was rain water harvested in farm pond. Total no of treatments were 12 which replicated four times. Plant geometry maintained in experiment was 30×10 (cm).Physiological characteristics of experimental field was Sandy loam soil with having pH 9.0 and EC (ds m^{-1}) 0.30 ds m^{-1}, percent organic carbon was 0.30 %, available nitrogen were 243 kg ha^{-1} , available P2O5 20.2 kg ha^{-1} and available potash was 247 kg ha^{-1} . Land of experimental field was plane and slightly slopy with fine soil structure.

The statistical calculations done by as per analysis of variance described by Gomez and Gomez [6] to analysis the test of significant of treatments.

3. RESULTS AND DISCUSSION

3.1 Number of Branches Plant^{-1} (80 DAS)

Data presented in Table 1 described that in mean data of two year highest number of branches (19.12) 80 DAS was found with three irrigations (25, 50 & 75 Days after sowing) which was at par with two irrigations (25 & 50 DAS) 18.15 and significantly higher over one irrigation (25 DAS). In terms of application of nitrogenous fertilizers highest number of branches plant^{-1} found with application of 80 Kg N ha^{-1} (20.07) which was at par with 60 kg N ha^{-1} (18.86).

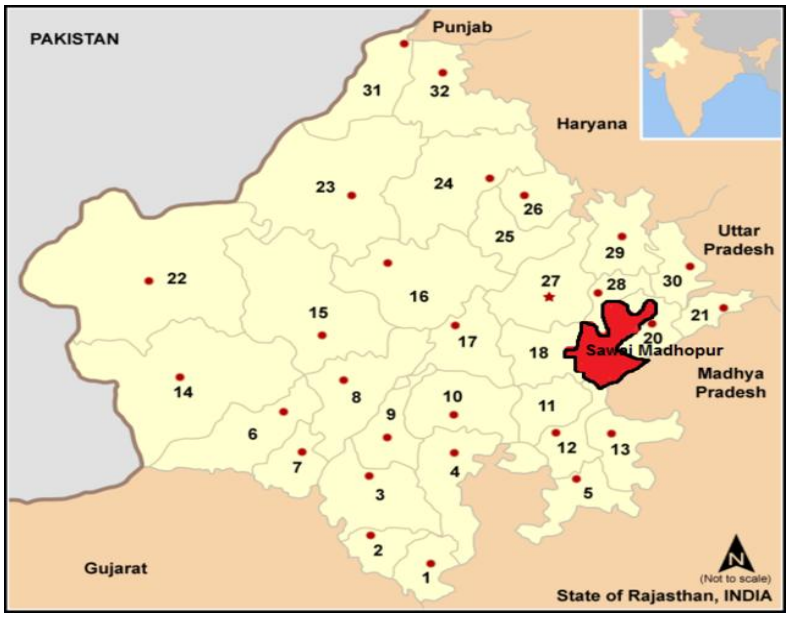

Fig. 1. Map showing the location of district Sawaimadhopur in Rajasthan

Fig. 2. Map showing the satellite view of experimental field at Krishi Vigyan Kendra, Sawaimadhopur, Rajasthan

Interactive effect of two irrigations (25 & 50 DAS) with application of 60 kg N ha^{-1} found most suitable and highest number of branches $plant^{-1}$.With increase in no of irrigations and nitrogen levels increases growth and yield parameters. Moisture availability during crop growing periods increases the no of branches $plant^{-1}$ of crop. N Fertilization plays a major role in increasing growth parameters of the garden cress. With application of urea it increases the uptake of nitrogen in plants significantly results in increases no of branches $plant^{-1}$ and growth parameters. Similar results were found with Tuncay et al. [7], Dewangan. [8].

According to Choudhary et al. [9] yield attributes increases due to application of high level of fertility which could enhances the synthesis of amino acid, protein and other growth substances, also enhances the metabolic activity, cell division. Application of higher fertilizer doses could enhances the availability and uptake of nutrients in soil which ultimately enhances the growth attributing characters and yield.

3.2 Fresh Weight at Harvest (g $plant^{-1}$)

Under three irrigation levels and different nitrogen levels highest fresh weight g $plant^{-1}$ was

found in I_3 (25, 50 & 75 DAS) 369.87 g which was at par with I_2 353.25 g plant^{-1} in the year 2018-19. Both the treatments were significantly found higher fresh weight over I_1 Irrigation (One at 25 DAS) 303.43 g plant^{-1}. Same trend was found in the year 2019-20 under irrigation levels. Mean analysis of two year data revealed that highest fresh weight g plant^{-1} was found under Three irrigation (25, 50 & 75 DAS) (I_3) 382.41 g plant^{-1} which was at par with two Irrigation (at 25 & 50 DAS) (I_2) and both treatments higher over Irrigation (One at 25 DAS) (I_1) 313.72 g plant^{-1}. In different nitrogen level applications highest fresh weight of 375.66 g plant^{-1} was recorded with application of 80 kg N/ha which was at par application of 60 kg N ha^{-1} (366.91g/plant) in the year 2018-19. Similar trend was recorded for the next year2019-2020. Mean data of both the years concluded that highest fresh weight g plant^{-1} was found under Three irrigation (25, 50 & 75 DAS) (I_3) 382.41 g plant^{-1} which was at par with two irrigation (at 25 & 50 DAS) (I_2) 365.22 g plant^{-1} significantly higher over Irrigation (One at 25 DAS) (I_1) 313.72 g plant^{-1}. In application of 80 kg N ha^{-1} (N_4) was found highest fresh weight 388.40 g plant^{-1} which was at par with 60 kg N ha^{-1} (N_4) 379.35 g plant^{-1}.

Fresh weight of plant depends on availability of moisture and nitrogen fertilization during crop growth period. Fertilization with urea basal application and after first irrigation availability of nitrogen to the crop was sufficient during crop growth period and irrigation was done time to time which results in higher fresh weight and growth parameters. Similar results were found in the study of Patnaik et al. [10] and Kumari and Patel [11].

3.3 1000 Seed Weight (g)

According to results in Table 2, the 1000 seed weight (g) was found highest under Three irrigation (25, 50 & 75 DAS) (I_3) 1.61 g which was at par with two Irrigation (25 & 50 DAS) (I_2) 1.56 g in mean data of both the years. Similar trend was found in both the years. Under different nitrogen levels highest 1000 seed weight g was found under 80 kg N ha^{-1} (N_4) 1.67 g which was at par with 60 kg N ha^{-1} (N_3) 1.55 in mean of both the years. Same results and trend were found during both the respective years. According to Khalil et al. [12] it has been described that due to water stress and short irrigation interval resulted in smaller leaf area. Higher siliqua per plant, 1000 seed weight was found with the shortest irrigation interval. This was due to changing in water balance of matured leafs which resulted in senescence in leafs. In addition leaf area was also decreased with this attraction of Co2 and light interception was also decreased which finally resulted in decrease of photosynthetic material which transferred to seed.

Table 1. Effect of irrigation and nitrogen levels on no. of branches plant^{-1} (80 DAS) & fresh weight at harvest (g plant^{-1}) of Chandrasur (*Lepidium Sativum*)

Treatments	Number of Branches plant^{-1}(80 DAS)			Fresh weight at harves (g plant^{-1})		
Irrigation levels	**2018-19**	**2019-20**	**Mean**	**2018-19**	**2019-20**	**Mean**
Irrigation (One at 25 DAS) (I_1)	15.75	16.81	16.28	303.43	324.01	313.72
two Irrigation (at 25 & 50 DAS) (I_2)	17.56	18.75	18.15	353.25	377.20	365.22
Three irrigation (25, 50 & 75 DAS) (I_3)	18.5	19.75	19.12	369.87	394.95	382.41
SEm±	0.57	0.61	0.423	11.16	11.92	8.17
CD (P=0.05)	2.00	2.14	1.306	38.65	41.27	25.17
Nitrogen levels						
20kg N ha^{-1} (N_1)	15.25	16.28	15.76	302.58	323.09	312.84
40 kg N ha^{-1} (N_2)	16.16	17.26	16.71	323.58	345.52	334.55
60 kg N ha^{-1} (N_3)	18.25	19.48	18.86	366.91	391.79	379.35
80 kg N ha^{-1} (N_4)	19.41	20.73	20.07	375.66	401.13	388.40
SEm±	1.07	1.14	0.783	18.38	19.63	13.44
CD (P=0.05)	3.10	3.32	2.22	53.35	56.97	38.13

3.4 Seed Yield (Kg ha^{-1})

Highest Seed yield 1593 kg ha^{-1} was found under three irrigations (25, 50 & 75 DAS) (I_3) which was at par with two Irrigation (25 & 50 DAS) (I_2) and significantly higher over Irrigation (One at 25 DAS) (I_1). Under N fertilization treatments highest yield was found with application of 80 kg N ha^{-1} (N_4)1586 kg ha^{-1} which was at oar with 60 kg N ha^{-1} (N_3) and significantly higher over 40 kg N ha^{-1} (N_2) and 20 kg N ha^{-1} (N_1) in pooled data of both the years. Similar trend in yield data was found during both the years under irrigation and nitrogen levels. This might be due to availability of moisture during crop growth periods which better leads to higher photosynthesis and higher amount of assimilates translocate towards reproductive structure. In soil moisture availability enough assimilates might have produced and utilized by plant during growth stage nd thus excess translocate towards storage compound. In later phase when more assimilate demand of plant reproductive system enhances the translocation of assimilates in plant sinks which resulted in higher yield. These results are in close conformity with Shivran et al. [13].

The significant increase in yield was found under the treatments when increases level of irrigations and dose of nitrogen but at some level 80 kg N ha^{-1} (N_4) and 60 kg N ha^{-1} (N_3) results found at par. Higher yield was a result of increase in morphological and physiological characters of plant. Available moisture during crop growth period can also enhances the nutrient uptake and oil content in green leafy crops and vegetables also which related to increasing in growth parameters and yield. Similar results were found in the study of Singh et al. [14], INNE et al. [15], Choudhary et al. [9].

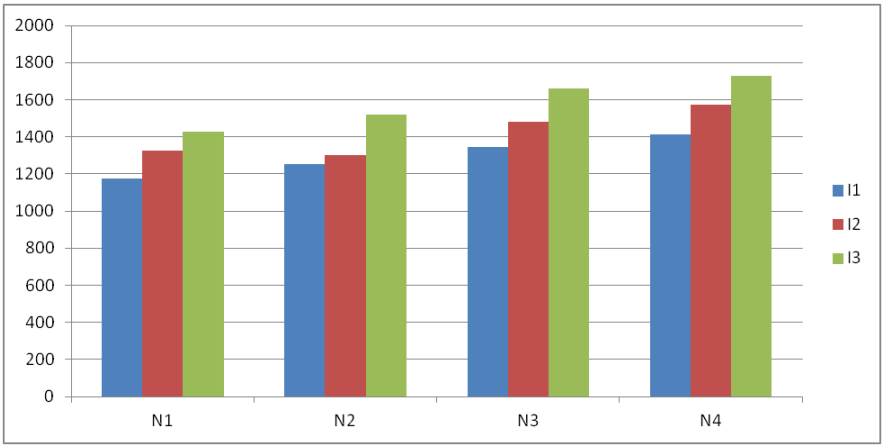

Fig. 3. Effect of irrigation and nitrogen levels on seed yield (Kg ha^{-1}) of Chandrasur (*Lepidium Sativum*)

Table 2. Effect of irrigation and nitrogen levels on 1000 seed weight (g) & seed yield (Kg ha^{-1}) of Chandrasur (*Lepidium Sativum*)

Treatments	1000 seed weight (g)			Seed yield (Kg/ha)		
Irrigation levels	**2018-19**	**2019-20**	**Mean**	**2018-19**	**2019-20**	**Mean**
Irrigation (One at 25 DAS) (I_1)	1.37	1.47	1.42	1247	1286	1266
two Irrigation (25 & 50 DAS) (I_2)	1.51	1.61	1.56	1408	1525	1466
Three irrigation (25, 50 & 75 DAS) ($I_{3)}$	1.56	1.66	1.61	1583	1602	1593
SEm±	0.05	0.05	0.03	52.41	44.25	48.33
CD (P=0.05)	0.16	0.17	0.10	181.38	153.13	167.32
Nitrogen levels						
20kg N ha^{-1} (N_1)	1.35	1.44	1.39	1287	1360.62	1323
40 kg N ha^{-1} (N_2)	1.46	1.55	1.50	1333	1410.44	1371
60 kg N ha^{-1} (N_3)	1.50	1.60	1.55	1471	1503.75	1487
80 kg N ha^{-1} (N_4)	1.61	1.72	1.67	1561	1611.02	1586
SEm±	0.04	0.04	0.03	44.24	40.46	41.67
CD (P=0.05)	0.12	0.13	0.08	128.37	117.43	121.56

Fertilization of nitrogen significantly increases the growth parameter of crops which is cumulatively increases yield of crop. Nitrogen is the main part of protein and nucleic acid which is the main nutrient used by the vegetables for their growth. It is The main element of chlorophyll, alkanoids and enzymes also [16]. Many studies revealed that with increasing level of nitrogen crop growth increases upto a certain level [17,18].

4. CONCLUSION

From the present study it may be concluded that, integration of two irrigation two Irrigation (25 & 50 DAS) (I_2) with 60 kg N ha^{-1} gives higher yield of growth parameters and seed yield.

COMPETING INTERESTS

Author has declared that no competing interests exist.

REFERENCES

1. Singh SP, Mahapatra BS, Pramanick B, Yadav VR. Effect of irrigation levels, planting methods and mulching on nutrient uptake, yield, quality, water and fertilizer productivity of field mustard (*Brassica rapa* L.) under sandy loam soil. Agric Water Manag. 2021;244.
   DOI: 10.1016/j.agwat.2020.106539.
2. Mali RG, Mahajan SG, Mehta AA. *Lepidium sativum* (garden cress) a review of contemporary literature and medicinal properties. Orient Pharm Exp Med. 2007;7(4):331-5.
   DOI: 10.3742/OPEM.2007.7.4.331.
3. Kirthikar KR, Basu BD. *Lepidium sativum* L. Indian Med Plants India Lalith Mohan Basu India. 1952;174-5.
4. Raghavendra RH, Akhilender NK. Eugenol and n-3 rich garden cress seed oil as modulators of platelet aggregation and eicosanoids in Wistar albino rats. Tonutraj. 2011;4(1):144-50.
   DOI: 10.2174/1876396001104010144
5. Zia-Ul-Haq M, Ahmad S, Calani L, Mazzeo T, Del Rio D, Pellegrini N et al. Compositional study and antioxidant potential of Ipomoea hederacea Jacq. and Lepidium sativum L. seeds. Molecules. 2012;17(9):10306-21.
   DOI: 10.3390/molecules170910306, PMID 22932212.
6. Gomez, KA, Gomez AA. Statistical procedures for agricultural research. New York: A Willey Inter science Publication, John Willy & Sons. 1984;317-56.
7. Tuncay O, Esiyok D, Yagmur B, Okur B. Yield and quality of garden cress affected by different nitrogen sources and growing period. Afr J Agric Res. 2011;6(3):608-17.
8. Dewangan Y. Effect of irrigation and nitrogen levels on growth and yield of Chandrasur (*Lepidium sativum*) under Chhattisgarh Plain. Asian Resonanace. 2015;4(2).
9. Choudhary MS, Choudhary M, Choudhary R, Choudhary S, Choudhary P, Dhayal S. Effect of fertility levels on growth and yield of Chandrasur (*Lepidium sativum* L.) Varities under Southern Rajasthan condition. Annals Agric Res. 2022;43(3): 340-7.
10. Patnaik JR, Kar MR, Mahapatra PK. Effect of irrigation and integrated nutrient management on yield and moisture use dynamics of mustard [*Brassica juncea* (L.) Czern and Coss]. Environ Ecol. 2016;34 (2):426-31.
11. Kumari I, Patel RA. Effect of irrigation and nitrogen on yield of cress (*Lepidium sativum* L.). Crop Res (Hisar). 2013;46 (1/3):231-3.
12. Khalil SE, Noemani AAE. Effect of irrigation intervals and exogenous proline application in improving tolerance of garden cress plant (*Lepidium sativum L.*) to water stress. J Appl Sci Res. 2012;8 (1):157-67.
13. Shivran H, Kumar S, Tomar R, Chauhan GV. Effect of irrigation schedules on productivity and water use efficiency in Indian mustard (*Brassica juncea L.*). Int J Chem Stud. 2018;6(4):15-7.
14. Singh and Paswan. The Potential of Garden Cress (*Lepidium sativum* L.) Seeds for Development of Functional Foods; 2017.
    Available:http://dx.doi.org/10.5772/intechopen.70355.
15. Inne A, Kul R, Ekinci M, Turan M, Yildirim E. Nitrogen fertilization affects growth, yield, nitrate and mineral content of garden cress (*Lepidium sativum* L.). Yuzuncu Yil Univ J Agric Sci. 2021;31(1).
16. Castellanos JZ, Uvalle-Bueno JX, Aguilar-Santelises YA. Manual de interpretación de análisis de suelos, aguas agrícolas, plantas ECP. Vol. 2ªed. INIFAP. Chapingo, México; 2000.
17. Topçuoğlu B, Yalçın SR. Azotlu ve fosforlu gübrelemenin ıspanak bitkisinin

(Spinaceae oleraceae L.) bazı Makro ve mikro besin maddesi içerikleri üzerine etkisi, Tarım Bilimleri. Dergisi. 1996;2 (2):39-48.

18. Mordoğan N, Ceylan S. Çakıcı H, Yoldaş F. Ege Univ Ziraat Fak Derg. Azotlu Gübrelemenin Marul Bitkisindeki Azot Birikimine Etkisi. 2001;38(1):85-92.

Peer-review history:
The peer review history for this paper can be accessed here:
https://www.sdiarticle5.com/review-history/96718