E-ISSN: 2618-0618
P-ISSN: 2618-060X

www.agronomyjournals.com
2024; SP-7(8): 13-15
Received: 18-05-2024
Accepted: 22-06-2024

Devasheesh Kumar
Department of Agronomy, RCA, MPUAT, Udaipur, Rajasthan, India

PC Chaplot
Department of Agronomy, RCA, MPUAT, Udaipur, Rajasthan, India

J Choudhary
Department of Agronomy, RCA, MPUAT, Udaipur, Rajasthan, India

DS Dudi
Department of Soil Science, RCA, MPUAT, Udaipur, Rajasthan, India

PB Singh
Department of Genetics and Plant Breeding, RCA, MPUAT, Udaipur, Rajasthan, India

Sohail Momin
Department of Genetics and Plant Breeding, RCA, MPUAT, Udaipur, Rajasthan, India

Kavita Yadav
Department of Agronomy, COA, Bhilwara, MPUAT, Udaipur, Rajasthan, India

Corresponding Author:
Devasheesh Kumar
Department of Agronomy, RCA, MPUAT, Udaipur, Rajasthan, India

Effect of fertility levels and bio-inoculants on nutrient content of chandrasur

Devasheesh Kumar, PC Chaplot, J Choudhary, DS Dudi, PB Singh, Sohail Momin and Kavita Yadav

DOI: https://doi.org/10.33545/2618060X.2024.v7.i8Sa.1209

Abstract
A field experiment entitled "Effect of Fertility Levels and Bio-inoculants on Chandrasur (*Lepidium sativum* L.)" was conducted during *rabi* season of 2023-24. The experiment was laid out at the Instructional Farm, Rajasthan College of Agriculture, Udaipur. The treatment consisted of one variety (ULS-15), three fertility levels (75% RDF, 100% RDF and 125% RDF) and five liquid biofertilizers levels (control, *Azotobacter*, *Azotobacter* + PSB, *Azotobacter* + KMB and NPK consortia, theresby making 15 treatments combinations replicated thrice in Factorial Randomised Block Design (FRBD). On the basis of results emanated from the present investigation, it can be concluded that under prevailing agro-climatic condition of zone IVa of Rajasthan it was observed that application of 125% RDF significantly increased nutrient content in seed and straw over application of 100% and 75% RDF, respectively and inoculation of seed with NPK consortia significantly increased nutrient content in seed and straw over inoculation of *Azotobacter* alone, *Azotobacter* + PSB, *Azotobacter* + KMB and control.

Keywords: Chandrasur, bio-inoculants, *Azotobacter*, RDF

Introduction
Chandrasur (*Lepidium sativum* L.) also known as asalio and garden cress belongs to family Brassicaceae. It is most commonly eaten in the seedling form, where it is the cress of mustard. It is a fast-growing crop that can be ready to eat within 7 days of sowing the seed. In India, it is cultivated as winter crop in selected parts of Rajasthan, Gujarat and Madhya Pradesh for seeds. Chandrasur seeds are bitter, thermogenic, depurative, rubefacient, galactogogue, tonic, aphrodisiac, ophthalmic, antiscorbutic, antihistaminic and diuretic. They are useful in the treatment of asthma, coughs with expectoration, poultices for sprains, leprosy, skin disease, dysentery, diarrhoea, splenomegaly, dyspepsia, lumbago, leucorrhoea, scurvy and seminal weakness. Seeds have been shown to reduce the symptoms of asthma and improve lung function in asthmatics. The seeds have been reported as possessing a hypoglycemic property and the seed mucilage is used as a substitute for gum arabic and tragacanth. Its seeds contain alkaloids lepidin, glucotropaeolin, besides sinapin, sinapinic acid, mucilaginous matter (5%) and uric acid (0.108 g kg^{-1}), vitamin- C and vitamins of B group. The seeds yield yellowish brown semidried oil which has peculiar disagreeable odour. Seeds contain 5.69% moisture, 23.5% protein. 15.9% fat, 5.7% ash and also rich in phosphorus, calcium and sulphur. These seeds are good source to enhance the milk percentage in cattle as well as in nursing mothers. Fresh leaves and young seedlings are mainly used as spice and are rich source of glucosinolates and also used as salads. Roots are bitter, acrid and are useful in treatment of secondary syphilis (Saraswathi *et al*., 2014) [8].

In India, it is estimated that the total area under this crop in India is about 8450 ha inspite of high medicinal values and skyrocketing market price of the seed of this crop, the average productivity at present is very low (320 kg ha^{-1}) which might be on account of lack of appropriate agro techniques (Meena, 2015) [6].

NPK consortium was used as liquid biofertilizers. It is a consortium of nitrogen fixing (*Azotobacter chroococcum*, *Azospirillum lipoferum)*, phosphate solubilizing and potash mobilizing native bacteria (*Bacillus* spp.), which are all compatible with each other.

It is used as seed treatment (3-5 ml kg^{-1} seed), soil application (1 L ha^{-1}), seedling treatment (3-5 ml L^{-1}) and drip irrigation (1 L ha^{-1}). The response of liquid biofertilizers in different crops such as cotton, banana, potato, rose, turmeric, papaya etc. reported better yield and quality. Liquid biofertilizers have a distinct advantage in terms of cost saving on chemical fertilizers in addition to yield advantage. The earlier products of biofertilizers were carrier (Solid) based where lignite is usually used as a carrier material. Lignite is hazardous to the production workers. Also, the shelf life of carrier based biofertilizers is 6 months only and is difficult to transport. Liquid biofertilizers on the other hand have a shelf life of minimum one year, with no health hazards to production workers and are easy to transport (Jangid, 2021) [3].

Materials and Methods

A field experiment entitled "Effect of Fertility Levels and Bio-inoculants on Chandrasur (*Lepidium sativum* L.)" was conducted during *rabi* season of 2023-24. The experiment was laid out at the Instructional Farm, Rajasthan College of Agriculture, Udaipur which is situated at 24° 35' North latitude, 74° 42' East longitude and at an altitude of 581.13 metres above mean sea level. It falls under agro climatic zone IVa "Sub- Humid Southern Plain and Aravali Hills" of Rajasthan. The treatment consisted of one variety (ULS-15), three fertility levels (75% RDF, 100% RDF and 125% RDF) and five liquid biofertilizers levels (Control, *Azotobacter, Azotobacterr* + PSB, *Azotobacter* + KMB and NPK consortia, thereby making 15 treatments combinations replicated thrice in FRBD. The data show that soil of experimental field was clay-loam in texture, slightly alkaline in reaction (pH 8.2), medium in available nitrogen (280.45 kg ha^{-1}) and phosphorus (19.15 kg ha^{-1}) while high in available potassium status (320.27 kg ha^{-1}). The total quantity of phosphorus, potassium and half dose of nitrogen were drilled in furrows before sowing of seed. Remaining half dose of nitrogen was top dressed at 35 DAS. Urea, DAP and MOP were used as a source of nitrogen, phosphorus and potassium, respectively. The seeds were treated with liquid bio-fertilizers *Azotobacter*, *Azotobacter* + PSB, *Azotobacter* + KMB and NPK consortia using 5ml kg^{-1} through standard procedure 2-3 hours before sowing as per treatment allocation. The seeds were thoroughly mixed with biofertilizers in such a way that all the seeds were uniformly coated with a layer of bio- fertilizers and then seeds were allowed to dry in the shade before sowing of crop. These liquid biofertilizers were obtained from Department of MBBT, Rajasthan college of Agriculture, Udaipur.

Results and Discussion

The estimate of nitrogen, phosphorus and potassium content in seed as well as in straw under the influence of various treatments are presented in Table 1.

Nitrogen

Fertility levels: An examination of data (Table 1) reveals that increasing levels of fertilizer application significantly influenced nitrogen content in seed and straw. Amongst fertility levels, application of 125% RDF recorded maximum nitrogen content in seed and straw which was significantly higher by 2.32, 7.68 and 1.33, 2.40 per cent, respectively over application of 100 and 75% RDF, respectively.

Liquid biofertilizers: Inoculation of chandrasur seed with liquid biofertilizers alone or in combination *viz.*, *Azotobacter* alone, *Azotobacter* + KMB, *Azotobacter* + PSB and NPK consortia significantly improved nitrogen content in seed and straw by 9.62, 10.12, 10.70, 11.78 and 2.27, 2.42, 2.57, 3.94 per cent, respectively over control. Among liquid biofertilizers, inoculation with NPK consortia synthesized maximum nitrogen content in straw and seed which was significantly higher by 1.3 and 1.9 per cent over inoculation with *Azotobacter* alone, respectively but at par dual inoculation of *Azotobacter* + PSB and *Azotobacter* + KMB.

Phosphorus

Fertility levels: A perusal of data (Table 1) indicates that fertility levels had significant effect on phosphorus content in seed and straw. Amongst fertility levels, application of 125% RDF produced seed and straw having highest phosphorus content which was significantly higher by 1.78, 3.46 and 3.10, 7.79 per cent, respectively over application of 75 and 100% RDF, respectively.

Liquid biofertilizers: It is explicit from data that inoculation of chandrasur seed with liquid biofertilizers alone and in combination significantly increased phosphorous content in seed and straw over control. Among liquid bio-fertilizers, inoculation with NPK consortia recorded maximum phosphorus content in seed and straw which was significantly higher by 4.9 and 12.8 per cent over control, respectively. Further inoculation of seed with *Azotobacter* alone in combination of *Azotobacter* + KMB and *Azotobacter* + PSB were at par with each other but significantly increased phosphorus content of seed by 3.6, 3.8 and 3.9 per cent, respectively over control. While *Azotobacter* + PSB and *Azotobacter* + KMB were at par in respect to phosphorus content of straw but both significantly enhanced phosphorus status of straw by 9.12, 9.45 and 10.13, 12.8 per cent, respectively over inoculation with *Azotobacter* alone and NPK consortia.

Potassium

Fertility levels: A reference to data (Table 1) indicates that application of fertilizer at varying levels had significant influence on potassium content of seed and straw. The chandrasur crop fertilized with 125% RDF recorded maximum potassium content in seed and straw which was significantly higher by 2.02, 4.14 and 1.68, 4.14 per cent, respectively over application of 100 and 75% RDF.

Liquid biofertilizers: Data show that inoculation of chandrasur seeds with liquid biofertilizers alone and in combination significantly improved potassium content in seed and straw. The significant improvement in potassium content in seed and straw was 2.42, 5.94, 6.09, 8.07 and 4.21, 4.39, 4.65, 6.50 per cent with the application of *Azotobacter alone, Azotobacter* + KMB, *Azotobacter* + PSB and NPK consortia over control, respectively. Among liquid bio-fertilizers, inoculation with NPK consortia synthesized maximum potassium content in straw and seed which was significantly higher by 2.2 and 2.3 per cent over inoculation with *Azotobacter alone*, respectively. but at par with inoculation of *Azotobacter* + PSB and *Azotobacter* + KMB.

Table 1: Effect of fertility levels and bio-inoculants on nutrient content of chandrasur

Treatments	Nutrient content (%)					
	Nitrogen		Phosphorus		Potassium	
	Seed	Straw	Seed	Straw	Seed	Straw
Fertility levels						
75% RDF	3.069	0.666	0.663	0.308	0.676	1.158
100% RDF*	3.230	0.673	0.674	0.322	0.690	1.186
125% RDF	3.305	0.682	0.686	0.332	0.704	1.206
S.Em.±	0.016	0.002	0.003	0.003	0.004	0.007
C.D. (P=0.05)	0.046	0.007	0.008	0.008	0.011	0.019
Liquid biofertilizers (5ml kg^{-1})						
Control	2.952	0.659	0.653	0.296	0.656	1.138
Azotobacter	3.236	0.674	0.677	0.323	0.693	1.186
Azotobacter + PSB	3.268	0.676	0.679	0.326	0.696	1.191
Azotobacter + KMB	3.251	0.675	0.678	0.324	0.695	1.188
NPK consortia	3.300	0.683	0.685	0.334	0.709	1.212
S.Em.±	0.021	0.003	0.004	0.003	0.005	0.008
C.D. (P=0.05)	0.060	0.009	0.010	0.010	0.014	0.025

*100% Recommended dose (60 kg N ha^{-1} + 40 kg P_2O_5 ha^{-1} + 40 kg K_2O ha^{-1})

The plant analysis revealed that application of 125% RDF to chandrasur crop recorded highest concentration of nitrogen, phosphorus and potassium in seed and straw at harvest over application of 100 and 75% RDF. Further, crop fertilized with same nutrients combination accumulated highest quantum of nutrients in both seed and straw along with total uptake by the crop (Table 1). The marked improvement in nutritional status of seed and straw due to application of 125% RDF could be ascribed primarily due to increased availability of these nutrients in soil environment along with extraction and translocation towards plant system. While on the other hand higher photosynthetic activity as evince from higher dry matter production from initial stage of the crop growth ascribe to the view that there was adequate availability of metabolites from shoot to root. In the preceding section, the role of NPK fertilization in improving congenial conditions in plant system for higher extraction of nutrient was well emphasized. It is generally believed that in plant system extracted nutrients are used for maintaining their critical concentration, which can be used for growth of developing structures. Thus, greater availability of nutrients with the application of 125% RDF to chandrasur crop seems to have maintained critical concentration of nutrients at cellular level, fulfilled their requirements for profuse plant growth and their efficient translocation towards sink component (straw and seed). Since most of nutrients (N, P and K) in seed is relocated their reserves in vegetative parts, better nutritional condition of seed with adequate fertilization seems to be on account of their higher concentration in plants. The results are in close agreement with finding of several researchers (Kumawat *et al.*, 2011; Saraswathi *et al*., 2011; Kumar *et al*., 2012; Chavda *et al*., 2015; Choudhary *et al*., 2019 and Tepan *et al*., 2021) [5, 7, 4, 1, 2, 9]. They also ascribed marked improvement in nutritional status of plants under adequate fertilization due to their increased availability in root zone and higher extraction due to better growth of roots.

Conclusion

On the basis of results emanated from the present investigation, it can be concluded that under prevailing agro-climatic condition of zone IVa of Rajasthan it was observed that application of 125% RDF significantly increased nutrient content in seed and straw over application of 100% and 75% RDF, respectively and inoculation of seed with NPK consortia significantly increased nutrient content in seed and straw over inoculation of *Azotobacter* alone, *Azotobacter* + PSB, *Azotobacter* + KMB and control.

References

1. Chavda NK, Patel RA, Patel P, Hirpara BV. Effect of nitrogen, phosphorus and sulphur on growth and yield of garden cress (*Lepidium sativum* L.). Biosci Biotech Res Asia. 2015;14(2):527-9.
2. 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.) varieties under Southern Rajasthan condition. Ann Agric Res. 2019;43(3):340-7.
3. Jangid AR. Nitrogen management through organic sources in linseed (*Linum usitatissimum* L.) under irrigated condition. MSc (Ag) Thesis, Department of Agronomy, Anand Agricultural University; 2021. Anand, Gujarat.
4. Kumar V, Bisht S, Teotia P, Sharma S, Solanki AS. Interaction between *Glomus fasciculatum* and *Azotobacter chroococcum* for yield, nutrient uptake and cost economy of (*Lepidium sativum* L.) in Indian arid region. J Agric Sci. 2012;46(1):21-8.
5. Kumawat A, Pareek BL, Yadav RS, Rathore PS. Effect of integrated nutrient management on growth, yield, quality and nutrient uptake of Indian mustard (*Brassica juncea* L.) in arid zone of Rajasthan. Indian J Agron. 2011;59(1):60-5.
6. Meena BK. Effect of sowing durations and stand geometries on growth, productivity and quality of chandrasur (*Lepidium sativum* L.). PhD Thesis, Department of Agronomy, Maharana Pratap University of Agriculture and Technology; 2015. Udaipur, Rajasthan.
7. Saraswathi G, Vidya KM, Hegde L, Chavan ML, Kumar BV. Effect of dates of sowing and fertilizer levels on nutrient uptake and economics of garden cress (*Lepidium sativum* L.). Plant Arch. 2011;14(1):327-30.
8. Saraswathi G, Vidya KM, Hegde L, Chavan ML, Kumar BV. Physiological parameters and quality of garden cress (*Lepidium sativum* L.) as influenced by dates of sowing and fertilizer levels. Plant Arch. 2014;14(1):455-6.
9. Tepan M, Kaushik MK, Choudhary J, Dudi DS, Bairwa H. Effect of various fertility levels and row spacing on nutrient content and uptake of chandrasur crop (*Lepidium sativum* L.). Pharma Innov J. 2021;12(2):1834-6.