The Pharma Innovation Journal 2022; 11(11): 1310-1312

www.ThePharmaJournal.com

The Pharma Innovation

ISSN (E): 2277-7695
ISSN (P): 2349-8242
NAAS Rating: 5.23
TPI 2022; 11(11): 1310-1312

www.thepharmajournal.com
Received: 25-08-2022
Accepted: 26-09-2022

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Effect of bio-fertilizers with hydrogel on growth character of linseed (*Linum usitatissimum* L.) under rainfed condition

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Abstract
A field experiment was conducted during the rabi season 2020-21 & 2021-22 at the Soil Conservation and Water Management Farm of Chandra Shekher Azad University of Agriculture and Technology, Kanpur (U.P). In a factorial Randomized Block Design with three Replication nutrient management *viz*. 100% RDF, 75% RDF +Azotobacter, 50% RDF + Azotobacter + PSB consisting with three moisture conservation practices *viz*. dust mulch, hydrogel@ 2.5 kg/ha, hydrogel@5 kg/ha. The result indicated that growth contributing character of linseed. *viz*., number of plant population, plant height, total dry matter plant^{-1}, dry weight per plant. The hydrogel @5 kg/ha with 75% RDF +Azotobacter was found significantly effective in producing higher growth linseed. Among the different dose of fertilizer with bio- fertilizers 75% RDF + Azotobacter produced significantly higher plant population plant height dry weight per plant growth characters over the 100%RDF and found at par with 50% RDF + Azotobacter + PSB. Similarly application of moisture conservation practices hydrogel @5 kg/ha recorded maximum plant height followed by hydrogel@2.5 kg/ha plant height minimum recoded in dust mulch. The data reveal that the hydrogel combination of bio- fertilizers give best growth of linseed crop under rainfed condition.

Keywords: RDF, Azotobacter, hydrogel, bio-fertilizers

Introduction
Linseed is an annual herbaceous plant and grows to a height of 30 to 120 cm. Fiber types are tall growing and less branched than the seed types. It has a well- developed fibrous root system with many lateral roots. The oil content of the seed varies from 33-47% and Flax contains 80-90% cellulose. Every part of the linseed plant is utilized commercially either directly or after processing. Most types of these basic varieties have similar nutritional characteristics and equal numbers of short-chain omega-3 fatty acids, poly unsaturated fatty acid that has nutritional and health benefits, apart from ALA, linseed is widely used as nutritional and functional food in the western world due to its high contents of therapeutic health promoting sustains such as omega-3 fatty acid, soluble and insoluble fiber and lignin and its suitability to use with bread, breakfast cereals and other food products. Omega-3 fatty acid help to reduce the risk of cardiovascular disease and cancer. Hydrogel polymer have the ability to absorb water is quite a hundred times its original weight within short period of time and the absorbed water under stress condition. Improving water use efficiency in the agricultural sector, particularly in arid regions, is becoming increasingly important in response to increasing global population and concomitant demand for food, water, and land. Super absorbent polymers, also known as hydrogel, can increase plant survival, plant growth, and plant water use efficiency. (Ekmi, *et al*., 2017) [3]. The yield is influenced by plant density suggested by various workers. Biofertilizer is substance in present living microorganism bacteria. It usually used on seed, plant surface or soil, Rhizophere and promotes primary compounds or nutrient for host plants. Biofertilizer include following organism. Bacterial isolates refer to specific bacterial strain which include following organism that promote to plant growth and inhibit to specific pest and carrier refer to a biotic substrate used in formulation of products. In bacterial inoculants quality should be present like- easy to use, tolerance abuse temperature ,ability to work under field and all type of soil, ability to survive long time for than one seasons and should be environment friendly. (Yoav *et. al*., 2013) [7]. Commonly used microorganisms as biofertilizer are Rhizobia, phosphate solubilizing bacteria (PSB) acts biofertilizer.

It includes *Bacillus megaterium* which efficiently solubilizing insoluble phosphorous into soluble form with the help of enzymatic and acidification process and it make easily absorbs this phosphorous by plant, it also regulate hormones and protect from plant diseases also. It improves soil fertility, quality and crop yield production. (Khan *et al*., 2013) [5]. Azotobacter has been found promising to improve nitrogen status of soil and crop yield due to their capacity to fix atmospheric nitrogen. In addition, it also secretes growth-promoting substance like gibberellins, IAA etc. Phosphorus solubilizing bacteria (PSB) become a source of P to plants upon its release from their cells. PSB reduce the P fertilizer application by 50% without any significant reduction of crop yield (Yazdani *et al*., 2009) [12].

Materials and Methods.

The experiment was conducted during the rabi season 2020-21 & 2021-22 at the Soil Conservation and Water Management Farm of Chandra Shekher Azad University of Agriculture and Technology, Kanpur (U.P).Which is situated in the alluvial tract of Indo - Gangetic plains in central part of Uttar Pradesh between 25^{o} 26' to 26^{o} 58' North latitude and 79^{o} 31' to 80^{o} 34'East longitude at an elevation of 125.9 meters from the sea level. This region falls under agro-climatic zone V (Central region). The experiment laid out Randomized Block Design with three replication, 27 treatments. The treatments combination of three dose of Nutrient management (Biofertilizer + fertilizer), N_1(100%RDF), N_2(75% RDF +Azotobacter), N_3 (50% RDF + Azotobacter + PSB) with application of three moisture conservation practices M_1(Dust mulch), M_2 (Hydrogel@5kg/ha), M_3 (hydrogel @2.5 kg/ha). The possibilities of application of super absorbent polymers (SAPs) in agricultural field have become increasingly important and have been investigated to alleviate certain agricultural problems like water stress condition.

Result discussions

The combination of hydrogel and fertilizer as slow release fertilizer hydrogel (SRFH) has become one of the promising materials to overcome the shortcomings of conventional fertilizer by decreasing fertilizer loss rate, supplying nutrients sustainably, and lowering frequency of irrigation. The presence of hydrogel in soil has enhanced the plant growth performances of model plant in term of its average leaf width and plant height Ekmi *et al*., (2017) [3].

Plant population

The number of plant per unit area of land at initial stage of plant growth & final plant population recorded at the time of maturity. Stage plant population recorded 75% RDF + Azotobacter is maximum followed by 100%RDF is population & least 50% RDF + Azotobacter + PSB. In moisture conservation practices maximum found in Hydrogel @5 kg/ha in both year followed by Hydrogel @2.5 kg/ha & least Dust mulch. At finial stage plant population recorded 75%RDF+Azotobacter recorded maximum followed by 100%RDF is population & least 50% RDF + Azotobacter + PSB. In moisture conservation practices maximum found in Hydrogel @5 kg/ha in both year followed by Hydrogel @2.5 kg/ha & least Dust mulch. Hydrogel not only function to absorb the water but also releases the water gradually as per the requirement of the plant. This helps in improved germination, rate of seedling emergence and rapid growth of root**.**

Plant height

Plant height recorded different stage of 30 days, 60 days, 90 days, at harvest than the maximum plant height in (48.25 cm) 75% RDF + Azotobacter followed by 100% RDF (45.86cm) & (41.50cm) least in 50% RDF Azotoacter + PSB always. The effects of fertilizer and their interaction on the characteristics and maximum potassium (3.10%) obtained and Azotobacter treatments and maximum calcium obtained under and Azotobacter treatments. Because of the side environmental effects of using chemical fertilizers, using bio-fertilizers is recommended. (Dehkordi, 2016) [2]. In use of moisture conservation practices effect will be maximum on Hydrogel@ 5 kg/ha (50.92cm) followed by Hydrogel@ 2.5 kg/ha (45.87cm) and minimum treatment dust mulch. Hydrogel have been reported to increase the activity of cell division, cell expansion and cell elongation, ultimately leading to an increased plant height. Similar results have been reported by Al-Harbi *et al*. (1996) [1] in cucumber.

Dry weight per plant

Dry weight per plant was recorded at different successive stages at 30 days, 60 days, 90 days, at harvest of crop growth in different treatment plots in all three replication and it is obvious from data presentation in Table. Dry weight per plant was recorded (11.53/plant) 75% RDF + Azotobacter maximum followed by 100%RDF (10.57/ plant) & least 50% RDF + Azotobacter + PSB is (9.08/plant). Similarly the moisture conservation practices (11.34 /plant) maximum found in Hydrogel @5 kg/ha, followed by Hydrogel @2.5 kg/ha (10.30/plant) & (9.54/plant) least Dust mulch. The polymer seed coating and seed treatment on plant growth and quality of Cowpea (Vigna unguiculata).it consisting of enhanced growth parameters *viz.*, plant height, number of effective and non-effective tillers, dry matter production, CGR and RGR and yield of pearl millet. Higher grain yield was a reflection of higher plant height, effective tillers/m, total dry-matter production, grain yield, stover yield and harvest index of pearl millet under application of 5.0 kg hydrogel/ha. (Ovalesha, 2017) [11].

Days of 50% flowering

The effect of sowing on the length of different development periods of linseed and reported the number of days from sowing to first flowering and harvest decreased as sowing is delayed. The effect of sowing on emergence percentage was not significant. The range emergence was 43 to 59% respectively. Days to flowering due to various treatments use of fertilizer with bio fertilizer and moisture conservation practices was presented in Table 3. The maximum number of flowering occur in 75% RDF + Azotobacter recorded maximum in both year followed by 100%RDF height & least 50%RDF + Azotobacter + PSB , Although PSB alone did not show any positive effect on symbiotic parameters and yield, however in conjunction it seemed to assert synergistic effect. The results imply that co-inoculation with Rhizobium, PSB and PGPR is a beneficial approach for improving the nodulation, growth and yield of lentil. (Khanna and Sharma, 2011) [4, 10]. The moisture conservation practices maximum found in hydrogel @5 kg/ha in both year followed by Hydrogel @2.5 kg/ha & least Dust mulch is also same in both

year. Hydrogel application increases the productivity in almost all the test crops such as cereals, oilseeds, vegetable crops and floricultural crops. This increases the agricultural productivity in terms of plant biomass, fruit size and seed yield. The present findings were in accordance with the results of many other crops like pearl millet (Singh, 2012) [9]. Bio-fertilizers (Azotobacter and PSB) and Trichoderma along with the recommended doses of fertilizers enhanced the plant growth and improved yield. (Pathak and Shailesh, 2010) [6, 8].

Table 1: Effect of bio fertilizer and hydrogel on growth characters of linseed crop.

Plant population			Plant height				Dry weight per plant				DAS to 50% flowering
Initial Plant population		Final Plant population	30 days	60 days	90 days	At harvest	30 days	60 days	90 days	At harvest	
Nutrient management											
N_1	609.50	592.83	20.60	25.65	43.68	45.86	6.78	9.43	10.40	10.57	65.05
N_2	614.33	597.44	21.18	39.28	46.27	48.25	9.26	10.37	11.28	11.53	67.17
N_3	602.61	586.16	18.66	38.08	39.58	41.50	6.78	8.13	8.93	9.08	63.78
Moisture conservation practices											
M_1	601.00	584.55	16.94	33.62	37.36	39.25	7.46	8.48	9.34	9.54	63.09
M_2	608.44	591.94	20.69	39.62	43.69	45.87	8.26	9.33	10.13	10.30	66.09
M_3	616.99	599.94	22.89	43.71	49.48	50.92	8.58	10.12	11.15	11.34	67.57
SE(d)	11.71	8.16	1.06	1.71	1.88	2.17	0.43	0.66	0.73	0.7	1.00
CD (P = 0.05)	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	N.S	NS

Conclusion

The biofertilizers it promotes growth by increasing the supply or availability of primary nutrients to the host plant. Commonly used microorganisms as biofertilizer are Rhizobia, phosphate solubilizing bacteria (PSB), Azotobacter acts biofertilizer. It also regulate hormones and protect from plant diseases also. It improves soil fertility, quality and crop yield production. . The crop responds to a fertilizer doses, provided the proper placement is done at proper moist zone. It is very well recognized the use of balanced fertilizer commensuration with crop needs and soil nutrients is indispensable for sustained production at high yield level. Nitrogen increased the growth attributing parameters of linseed also. The applications agricultural hydrogel are not only used for water saving in irrigation, but they also have tremendous potential to improve the biological and Physico-chemical properties of the soil. This improves the porosity, bulk density and water holding capacity of the soil. The application of hydrogel can be a potential alternative to improve photosynthetic efficiency, assimilate partitioning, and increase growth and yield of the crop**.** In the present investigation higher growth characters was recorded with the hydrogel @5 $kgha^{-1}$ with 75% RDF + Azotobacter. Thus, the above dose can be recommended to the farmer to generate more profit from the linseed cultivation under rainfed situations. Agricultural hydrogel are eco-friendly as they are bio-degraded over a period of time, without having any residual activity on the soil.

References

1. Al-Harbi AR, Al-Omran AM, Shalaby AA, Choudhary MI. Efficacy of a hydrophilic polymer declines with time in house experiments, Horticulture Science. 1996;34:223-224.
2. Dehkordi SSA. Effect of bio-fertilizer and fertilizer on some morphplogical and physiological characteris of linseed; c2016.
3. Ekmi Rabata Nurul, Hashimb Shahrir. Effect of different monomers on water retention properties of slow-release fertilizer hydrogel; Procedia Engineering. 2016;148:201-207.
4. Khanna and Sharma. Potential for enhancing lentil (*Lens culinaris*) productivity by co-inoculation with PSB, plant growth-promoting rhizobacteria and Rhizobium, Punjab Agricultural University, Ludhiana, Punjab 141 004 Received: 7 December 2010; Revised accepted: 14 July 2011.
5. Khan MS, Ahmad F, Zaidi A, Oves M. Functional aspect of Phasphate solubilizing bacteria: Importance in crop production, Bacteria in Agronomy: crop productivity, 2013, 237- 263.
6. Pathak AK, Shailesh G. Effect of organic fertilizers, biofertilizers, antagonists and nutritional supplements on yield and disease incidence in Indian mustard in arid soil. Indian Journal of Agricultural Sciences. 2010;80(7):652-654.
7. Yoav Bashan, Prabhu SR, Hernandez JP. Advances in plant growth promoting technology formulation and practical perspectives; c2013.
8. Pathak AK, Shailesh G. Effect of organic fertilizers, biofertilizers, antagonists and nutritional supplements on yield and disease incidence in Indian mustard in arid soil. Indian Journal of Agricultural Sciences. 2010;80(7):652-654.
9. Singh H. Effect of hydrogel on growth, yield and water use efficiency in pearl millet (*Pennisetum glaucum*) production. Forage Research. 2012;38(1):27-28.
10. Khanna and Sharma. Potential for enhancing lentil (*Lens culinaris*) productivity by co-inoculation with PSB, plant growth-promoting rhizobacteria and Rhizobium, Punjab Agricultural University, Ludhiana, Punjab 141 004 Received: 7 December 2010; Revised accepted; 2011.
11. Ovalesha MA, Yadav B, Prashant Kumar Rai. Effects of polymer seed coating and seed treatment on plant growth, seed yield and quality of Cowpea (*Vigna unguiculata*). Journal of Pharmacognosy and Phytochemistry, 2017, 6(4).
12. Yazdani F, Allahdadi I, Akbari GA. Impact of super absorbent polymer on yield and growth analysis of soybean (*Glycine max* L.) under drought stress condition. Pakistan Journal of Biological Science. 2009;10:4190-4196.