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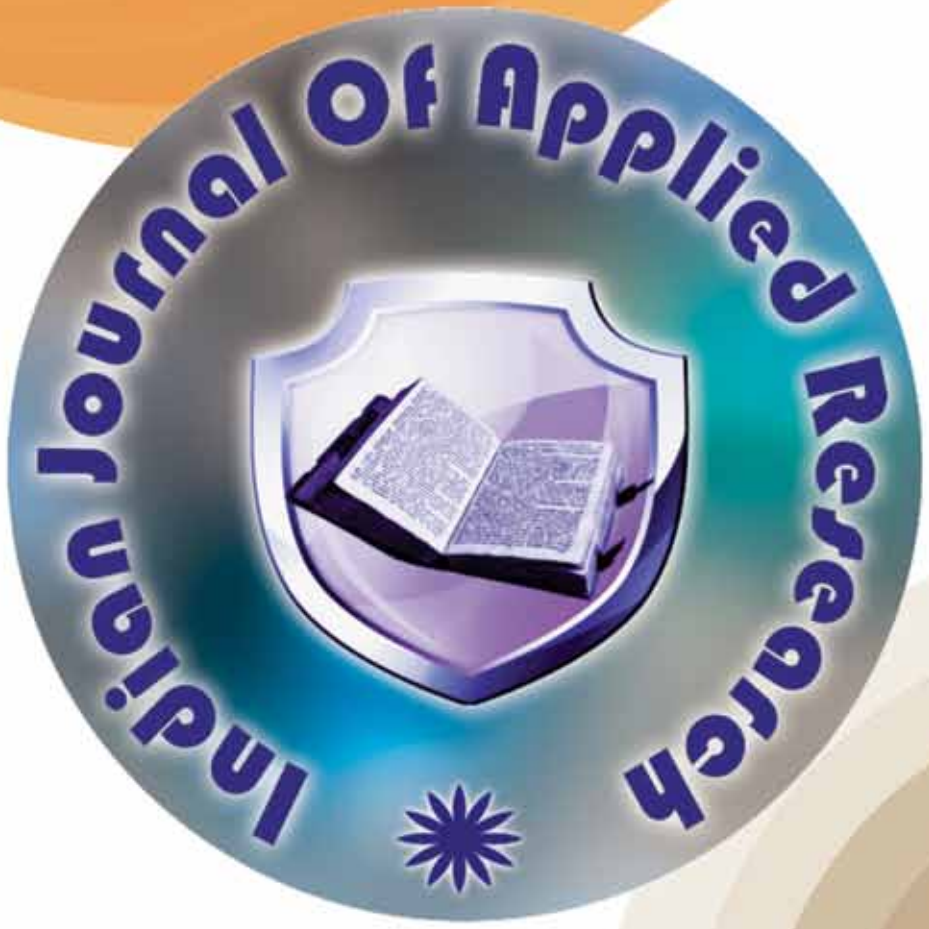

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Research Paper Biochemistry

Impact of Liquid biofertilizers, Chemical fertilizers and Vermicompost on the Growth and Yield of Chenopodium album (L.)

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ABSTRACT

Extensive use of chemical fertilizers to improve plant health and productivity and control of pathogens has disturbed the ecological balance of soil and has led to the depletion of nutrients. It is the need of the day to save our environment from pollution and sustaining crop production. The present study was carried out to quantify the impact of different liquid biofertilizer, vermicompost, urea and muriate of potash on the growth and yield of Chenopodium. A pot culture study was laid out in completely randomized block design and each treatment was replicated three times. The study concluded that the application of liquid biofertilizer with vermicompost and recommended dose of N and K improved the growth and yield of Chenopodium album. Among the four different liquid biofertilizers used (Azospirillum, Phosphobacteria, Azophos and Azophosmet), Azophos along with 50% N and K improved the growth and yield of Chenopodium album tremendously.

Keywords : Parupukeerai, Biofertilizer, Organicfertilizer, WildSpinach, Vermicompost

Introduction

The agriculture development strategy for India in the 21st century must be through increasing productivity of the land under cultivation, with reduced costs of production and higher use efficiency of inputs with no harm to the environmental quality. It has been realized that the soil fertility can be managed in complete harmony with sustainable agriculture development by careful analysis of current issues of sustainable land productivity (Saleh, 2008). A real challenge faced in the agricultural research field is to stop using the high rates of agro-chemicals which negatively affect human health and environment (Soleimanzadeh et al., 2010).

Obsessive and excessive use of chemical fertilizers coupled with irrigation has rendered the soils unfit for cultivation. It has been replaced by environment friendly liquid biofertilizers. Usually for seed treatment carrier based formulation is practiced. But irrespective of the carrier based inoculants, production and application procedure were found to be time consuming, untidy and difficult when used for large quantities of seed. Hence alternate liquid inoculants were developed for seed treatment as it is easy to use, spread well, mixed easily and no need of additional supply of water. Azospirillum, Phosphobacteria and Methylotroph colonizing in the rhizosphere region and has the ability to fix nitrogen, solubilize phosphorus and stimulate plant growth are the beneficial bacteria (Selim et al., 2009). Vermicompost not only increase the soil fertility through the addition of plant growth hormones and increased the level of soil enzymes, they are also responsible for the dissemination of important microorganisms as they are rich in microbial diversity, population and activity (Gopal et al., 2009).

Chenopodium spp. has been cultivated since centuries as a green leafy vegetable and subsidiary grain crop in different parts of the world. Ancient Indian texts describe the plant as being oleaginous, diuretic, aphrosidiac and useful in eye diseases, piles and diseases of heart and spleen. Recently, the genus has been recognized to have antitumor, antifungal and antioxidant activity. The leaves and tender stems are consumed as food and fodder (Bhargava et al., 2010).

Thus the present study was carried out to find the impact of liquid biofertilizers (Azospirillum, Phosphobacteria, Azophos and Azophosmet), chemical fertilizers (urea and muriate of potash) and vermicompost on the growth and yield of Chenopodium album (L.).

Materials and Methods

Liquid biofertilizers, Vermicompost and the seeds of Chenopodium album (L.) were collected from Tamil Nadu Agricultural University, Coimbatore. The study was carried out as pot culture with three replications for each treatment. The experiment was laid out in completely randomized block design. Each pot was filled with 8 kg of soil. Vermicompost was added to each pot at the rate of 5 tonnes ha-1 to enrich the soil nutrition. The soil was mixed in liquid biofertilizers (Azospirillum, Phosphobacteria, Azophos and Azophosmet), Nitrogen (urea) and Potassium (muriate of potash).

The treatments were as follows:
C- Azospirillum + Phosphobacteria + 100% recommended dose of N and K

T1- Azospirillum + 50% recommended dose of N and K

T2 – Phosphobacteria + 50% recommended dose of N and K

T3- Azophos + 50% recommended dose of N and K

T4- Azophosmet + 50% recommended dose of N and K

T5- Azospirillum + 25% recommended dose of N and K

T6- Phosphobacteria + 25% recommended dose of N and K

T7- Azophos + 25% recommended dose of N and K

T8- Azophosmet + 25% recommended dose of N and K

The 100% recommended dose of N is 75 kg ha-1 and that of K is 25 kg ha-1. The control group has the carrier based inoculum with the microbial population of about 18x106 cells of Azospirillum /g and 15x105 cells of Phosphobacteria /g. The treatment T1 to T8 consists of liquid biofertilizers with the

microbial population of about 12x107cells of Azospirillum /ml, 9x107 cells of Phosphobacteria/ml and 3x106 cells of Azophosmet /ml.

The growth attributes of Chenopodium album (L.) such as root length, shoot length, fresh weight, dry weight and the number of leaves were recorded on the 45th and 60th day after sowing.

Results and Discussion

Root length and Shoot length

The table 1 illustrates the root and shoot length of Chenopodium album (L.) on the 45th and 60th day of growth.

Table 1: The root and shoot length of Chenopodium album (L.)

Treatments	Root length (cm)		Shoot length (cm)	
	Days after sowing		Days after sowing	
	45	60	45	60
C	7.6	10.46	21.40	30.06
T1	5.3	8.26	16.66	24.96
T2	5.2	8.76	20.63	26.33
T3	8.5	12.36	27.53	30.46
T4	3.4	5.33	16.13	20.30
T5	3.5	5.40	14.10	17.70
T6	3.6	6.23	15.40	19.40
T7	4.6	7.72	16.13	20.26
T8	3.6	6.66	13.43	16.96
CD(0.05)	1.02		2.33	

Values are mean of triplicates

Root length

The root length of the treatment T3 (Azophos) was found to be maximum on the 45th day as well as on the 60th day of growth. The other treatments did not influence the root length very much. Ashrafuzzaman et al. (2009) also reported that the use of PSB isolates significantly increased the root length of rice. A study by Mariana et al. (2009) reported that the root length of Zea mays has been increased by the use of Azospirillum. Karthikeyan et al. (2007) also suggested that the inoculation of Azospirillum had increased the root and shoot length of Catharanthus roseus.

Shoot length

The Treatment T3 (Azophos) was also found to be superior in registering the maximum shoot length on the 45th day as well as on the 60th day of growth. Thus the inoculation of liquid Azophos with N, K and vermicompost have promoted the shoot length of the Chenopodium album (L.). The findings of Datta et al. (2009) shows that the growth attributes of the mustard were significantly increased by the impact of biofertilizer, compost and chemical fertilizers. The maximum plant height was observed in the treatment involving the combination of biofertilizers (Azospirillum + Candida tropicalis) and organic nitrogen as reported by Stino et al. (2009).

Fresh weight, Dry weight and Number of leaves

The fresh weight, dry weight and number of leaves of Chenopodium album (L.) on the 45th and 60th day of growth are presented in Table 2.

Table 2: Fresh weight, Dry weight and Number of leaves of Chenopodium album (L.)

Treatments	**Fresh weight (g/plant)**		**Dry weight (g/plant)**		**Number of leaves/plant**	
	Days after sowing		**Days after sowing**		**Days after sowing**	
	45	**60**	**45**	**60**	**45**	**60**
C	1.43	2.01	0.62	1.00	11	15
T1	1.33	2.00	0.58	1.01	10	15
T2	1.24	1.98	0.49	0.97	10	14
T3	1.51	2.16	0.86	1.13	11	17
T4	1.21	1.87	0.79	0.95	9	13
T5	0.98	1.52	0.32	0.88	8	12
T6	0.86	1.45	0.20	0.82	8	13
T7	1.04	1.62	0.45	0.91	9	15
T8	0.99	1.69	0.37	0.90	7	11
CD (0.05)	0.003		0.003		2.13	

Values are mean of triplicates

Fresh weight

Among the treatments, T3 (Azophos) was found to be superior with the maximum fresh weight which was followed by the control and T1 (Azospirillum). Thus it was clear that the combined application of Azophos, 50% N and K and vermicompost had enhanced the fresh weight of the plants. The enhanced biomass might be due to the improvement of soil physical conditions along with the increased availability of nutrients.The findings of Mybassara et al. (2008) suggested that the inoculation of Azospirillum Spp. increased the fresh weight of wheat. The combined application of Azospirillum and Azotobacter with 50% NPK was found to increase the fresh weight of fennel as reported by Mahfouz and Sharaf-Eldin (2007).

Dry weight

It was clear from the Table 2 that the treatment, T3 (Azophos) had shown the maximum dry weight on both the stages of growth which was followed by T4 (Azophosmet) on the 45th day of growth and T1 (Azospirillum) on the 60th day of growth. A study by Ramalakshmi and Raj (2008) reported that the application of biofertilizers increased the dry weight of cotton significantly. Han and Lee (2005) stated that the application of PGPR increased the dry weight of lettuce under saline condition.

Number of leaves

Even though the treatment T3 and control had shown the same number of leaves on the 45th day of growth, the treatment T3 was found to be superior on the 60th day of growth. Warade et al. (2007) reported that the combined treatment of vermicompost and PSB was shown a significantly higher number of leaves in Dahlia. A study by Shaukat et al. (2006) also suggested that the inoculation of seed with Azospirillum had increased the number of leaves in Helianthus annus.

Conclusion

The study concluded that the application of liquid biofertilizer with vermicompost and recommended dose of N and K improved the growth and yield of Chenopodium album (L.). Among the four different liquid biofertilizers used (Azospirillum, Phosphobacteria, Azophos and Azophosmet), Azophos along with 50% N and K and vermicompost improved the biometric parameters- root length, shoot length, fresh weight, dry weight and number of leaves of Chenopodium album (L.).Thus Liquid Biofertilizer and vermicompost can be used to improve the plant growth and soil fertility without causing any pollution or reduction in the nutrient content of the soil.

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