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Effect of Biofertillizers [Azatobacter and Phosphorus Solubilizing Bacteria (PSB)] and Their Combination on Root Length of *Brassica campestris*

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ABSTRACT: The investigation was carried out *Brassica campestris* and it has been cultivated with the treatment of two biofertilizers *Azatobacter* and *Phosphorus solubilizing bacteria* (PSB).In varities K-88 and YS-66, The effect of 15 g *Azatobacter* inoculation showed 6.8+_0.2 root length respectively, 15 g PSB inoculation showed 6.9 +_ 0.1 root length respectively, and 15+15 gm *Azatobacter* + *PSB* inoculation showed 6.9 +_ 0.1 root length respectively. Control seeds of both cultivars showed 6.4 +_ 0.1 root length.

Keywords: *Brassica Campestris; Azatobacter;,PSB*; Variety K-88 and YS-66.

INTRODUCTION: The genus *Brassica* consist of over 150 species of annual and biennial herbs, several of which are cultivated as oil seed crops (rape and mustard) or as vegetable crops (cabbage and cauliflower). The *Brassica* groups of oil seed crops commonly known as rape seed mustard[7] which are the second largest oil seed crop next to groundnut in terms of area and production in India . Indian mustard is the predominant crop among the *Brassica* oilseeds occupying near 90 % of the total area. Besides this, identification, classification and documentation of species and cultivars. The seed of *Brassica Campestris* (White mustard) yield mustard oil or Karwa tel which is widely used as a cooking medium. *B.nigra* and *B. juncea* also produce oil after extracting oil thae cake is left behind, which highly nutritious as a cattle feed, the oil cake is also used as soil fertilizer. Raphanus seeds also produce pungent oil which is often used in adulteration of sarson oil, this oil has digestive properties.

Sarson is an important oil seed crop in India and is more commonly grown in Bengal, Bihar, U.P M.P and it is also grown in Punjab. It is mostly grown as a Barani Crop. It is generally sown in October and harvested in the middle of February. The crop is seldom inter -cultivated. Its seeds have medicinal value. It is also used for oil baths and it is believed to strengthen the skin and to keep it cool and healthy with camphor it forms an efficacious embrocation in cases of muscular rheumatism and stiff neck etc. Oilseed *Brassica Campestris* are well adapted to cool and moist growing condition because they have the ability to grow at low temperature. *Brassica Campestris* crop can grown as a winter crop in temperate zone and spring crop at higher elevation. The Indian Subcontinent, China, Canada and northern Europe are the major oilseed *Brassica* producer region in the world. Bio-fertilizers play an important role in the improvement of soil. The use of biofertillizers is also useful to reduce the pollution rate in the soil and water. It has playing vital role in Integrated Plant Nutrient Supply (IPNS).Chemicals secreted by bio-fertilizers which leached out soil and ultimately effect the growth. PSB[5] alone also showed prominent effect this may perhaps due to that phosphorus helped in proliferation of root system. *Azatobacters* fix nitrogen and also secrete certain growth hormones such as indole acetic acid, gibberellic acid and cytokinin which promote vegetative growth and root development. They also enhanced availability of phosphorus due to PSB which confirm the finding of Surendra and Sharanappa, (2000)[8] observed better root growth in Maize. Dhumal, (1992)[3] found that application of biofertilizer significantly increased the average root length; he recorded maximum root length in sunflower, brinjal, spinach. Atmosphere contains 78% nitrogen which is most essential plant nutrient for plant growth and crop yield nitrogen; since it is widely consumed by majority of plants most of soils are deficient in it. Three types of bacteria i.e. Symbiotic. Non-symbiotic, free living and associative are useful to reduce molecular form of atmospheric nitrogen into ammonia (NH_3) which is assimilated by the plants. These are called Nitrogen fixing bacteria. The ability to fix nitrogen is a vital physiological characteristic of *Azatobacter*[6].The range of fixation is 2-15 mg N

fixed/g of carbon source utilized. *Azatobacter* cells are not usually present on the root surface but are abundant in the rhizosphere and protect the roots from other pathogens present in the soil. Root exudates which contain amino acid, sugars, vitamin and organic acids together with the decaying portion of root system serve as energy source for *Azatobacte*r multiplication.

Phosphate is available in soil in insoluble form, Phosphate solubization[4,9 &10] by these micro- organisms is brought about by chelating effect and production of organic acids. Some of which have been identified as malic, glyoxalic, succinic, fumaric, citric and alpha keto glutaric acid. Lactic and 2-ketogluconic acids act as a powerful chelator of calcium while humic acid and fulvic acids from stable complexes with iron and aluminum phosphates, thus make increased quality of phosphorus available to plants. Inoculation of seed per seedling can solubilize applied phosphate varying from 40-50 kg P_2O_5 per hactare when these microorganisms are incorporated with seeds per seedlings and in soil they ensure enhanced crop production by way of Biological Nitrogen Fixation, solubilisation of fixed phosphate, uptake of phosphate and other mineral nutrients and synthesis of growth promoting substances. These are known as Bio-inoculants; culture or TEEKA.

MATERIAL AND METHODS: This work was conducted in Saifia Science College, Bhopal during two successive winter season (2007-2008 & 2008-2009). In these studies, the effect of biofertillizers *Azatobacter* and *Phosphorus Solubilizing Bacteria (PSB)* and their combination on root length of *Brassica Campestris*

Collection of seeds: The seeds of two common cultivars YS-66 and K-88 *Brassica campestris* L. Sarson were collected from Sehore Agriculture College, Sehore.

Collection of bio-fertilizers: Bio-fertilizers, Azatobacter and PSB used in seed inoculation were brought from M.P. Agro Industries, Bhopal.

Experimental Site: Two experiments were conducted, one in laboratory, pot experiment and second field experiment, simultaneously in October to Middle of February. The chemical analysis of soil and nutrient content of seeds were analyzed at Indian Institute of Soil Science (IISS), Bhopal. It is generally grown mixed with wheat or barley.

Application of bio-fertilizers and seeds :- Seeds were treated with fungicide i.e. thirum @ 3g/kg of seed then inoculated with *Azatobacter*, PSB culture, manually (a) 0.5 gm/kg, (b) 1.0 gm/kg, and (c) 1.5 gm/kg of seeds lot respectively. In third treatment *Azatobacter* culture were mixed with PSB thoroughly to make one single homogeneous lot. The mixing process should be done in shade. These bio-fertilizer were inoculated on two cultivars YS-66 and K-88 at the time of sowing except their respective controls, (un-inoculated).

RESULTS AND DISCUSSION: Table 1 shows the root length of 20 days old seedling of *Brassica Campestris* treated with different doses of biofertillizers *Azatobacter* and *Phosphorus Solubilizing Bacteria (PSB)* and their combination. 25 plants were uprooted with the help of 'Plucker'. After removing the soil by tap water, root length was measured with the help of meter scale at 20 days after transplanting. The average length of root was calculated and statistically analysed.

In all the treatment *Azatobacter,* PSB and their combination showed a significant increase in root length of 20 days old seedlings in both cultivars[2 & 5] during 2007-08 and 2008-09. Combined treatment showed prominent effect on the root length[1]. Statistical analysis also confirms the result in comparison of their respective control. In this parameter, the more effect was observed on K-88 in comparison of YS-66. K-88 is more susceptible to Bio-fertilizer. Highest root length (3) was observed under combined treatment of *Azatobacter* + PSB, 15 gm. + 15 gm., 6.9+_0.1 in both cultivars in two years against their control respectively.

Table 1: Effect of different doses of Biofertillizers *Azatobacter, PSB* and their combination on the 20 days old seedling root length (cm.) of two cultivars YS-66 and K-88 of *Brassica campestris* L.

S. No.	Biofertillizers	Treatments	Root length (cm.) in 20 days old seedlings			
			Cultivar YS-66		Cultivar K-88	
			2007-08	2008-09	2007-08	2008-09
1	Azotobacter	5 gm.	63±0.1	6.3±0.1	6.3±0.2	6.4±0.1

2	Azotobacter	10 gm.	6.7±0.1	6.6±0.2	6.7±0.1	6.7±0.2
3	Azotobacter	15 gm.	6.8±0.1	6.8±0.1	6.7±0.1	6.8±0.2
4	PSB	5 gm.	6.2±0.1	6.3±0.1	6.2±0.1	6.2±0.1
5	PSB	10 gm.	6.6±0.1	6.5±0.1	6.6±0.1	6.6±0.1
6	PSB	15 gm.	6.8±0.2	6.8±0.2	6.9±0.1	6.9±0.1
7	Azotobacter+PSB	5 gm. + 5 gm.	6.5±0.2	6.6±0.2	6.4±0.2	6.5±0.2
8	Azotobacter+PSB	10 gm. + 10 gm.	6.6±0.1	6.7±0.1	6.8±0.1	6.7±0.1
9	Azotobacter+PSB	15 gm. + 15 gm.	6.9±0.1	6.8±0.1	6.9±0.1	6.9±0.1
10	Untreated	Control	6.2±0.1	5.9±0.1	6.4±0.1	6.0±0.1

LSD 0.05 = 1.72; CV% = 2.12

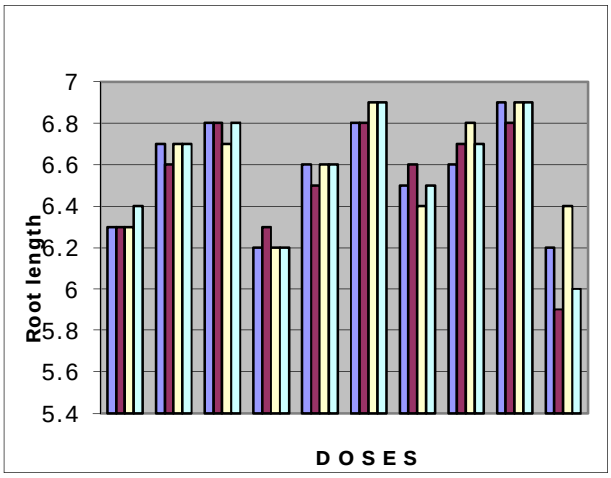

Figure 1: Effect of different doses of Biofertillizers *Azatobacter, PSB* and their combination on the 20 days old seedling root length (cm.) of two cultivars YS-66 and K-88 of *Brassica campestris* L.

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