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Role of Azolla Biofertilizer extract in producing healthy tomatoes (PKM 1) by Top of Paper germination method

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Abstract

Well known commercial tomato seeds (PKM 1) obtained from a local seed agency. All seeds were grouped into 7 groups (10%,20%,30%,40%,50%,100% and control) equivalent to different Azolla biofertilizer extract. Seed germination test was done on petriplates (top of paper method). Seeds of each group were left immersed in the equivalent concentration of before 24 hours. Azolla biofertilizers were foliar applied using (10ml) syringe, weekly once. Vegetative growth of tomatoes was expressed as number of leaves, number of branches, leaf area and plant height were estimated. Azolla biofertilizer extracts, 30% concentration showed the maximum increase in germination, shoot length, root length compared to control. Completely Randomized Design (CRD) with 7 treatment and 3 replication was adapted.

Keywords: Tomato seeds (PKM 1), Azolla biofertilizer extract, Petriplates, CRD

Introduction

Recently we can see some foods that grow with the help of lot of chemical fertilizer, pesticides and insecticides. Dishonest farmers adopt unhealthy means to increase food production which in turn cause non organic food health risks. According to WHO, about 30,00,000 people around the world are suffering from pesticides from nonorganic foods and 2,20,000 people die due to consume of non organic foods.

Biofertilizer do not pollute the soil or environment. Azolla strain can fix 30-60kg of N /ha, in 30 days (Wagner 2011). The fern is used to a great extent in China, India (Raja et al. 2012), Bangladesh and Vietnam (Phong et al. 2011) as an important biological source to improve the N balance of rice fields. The nitrogen fixed by the cyanobacterial symbiont is released upon decay of the incorporated Azolla (Ortiz-Marquez et al. 2014).

Tomato, berry of the plant *Solanum lycopersicum* is a fruit native to South America. Tomatoes are now the fourth most popular fresh market vegetable behind potatoes lettuce and onions. It is labelled as a vegetable for nutritional purposes. In present days, it is gaining more medicinal importance because of the antioxidant property of Ascorbic acid & Lycopene content. It is reported to have antiseptic properties against intestinal infection.

Materials and methods

Azolla spp strain was grown in a concrete pit size of 2*1*0.5m. Primarily 10kg red soil is distributed evenly across the bottom of the pit. After that 10kg cowdung and 100kg super phosphate is added. Then, the pit is filled with water till the water reaches to the height of 10 to 15 cm above the soil. On next day, mother culture of azolla was inoculated after stirring the water. It could double its blossom within 3 to 10 days. Generally, it will give 10 kg of azolla within 7 days. For the first 7 days, azolla are not supposed to be harvested.

After 7th day, azolla is harvested in plastic trays using sieve. Since the process involves boiling, the medium should be ensured for aseptic condition. So, the cooker is sterilized with ethanol overnight before boiling. Extract is obtained by the following process: Azolla is collected in a tray and washed to remove impurities and debris. Then it was rinsed with 0.01% $Hgcl_2$ for one minute. After that it was dried out on tissue paper for 30 minutes. Azolla of 1Kg

was boiled in 1L distilled water for 30 to 45 minutes. Finally filtrate was collected, and considered as 100% raw azolla extract. From which different concentration were made (10%,20%,30%,40%,50%) by means of distilled water.

Seven treatments and three replications were carried out in 21 petriplates. Root length and shoot length were measured on 5th and 14th day after sowing. Germination percentage is calculated using the formulae. A completely randomized design (CRD) with 7 treatment and 3 replication was adopted. Random sampling was done by Lottery method. Lay out is mentioned as below.

T1R2	T4R2	T3R3
T3R1	T6R3	T2R2
T6R2	T1R1	T5R1
T2R1	T7R2	T3R2

(T1-10%, T2-20%, T3-30%, T4-40%, T5-50%, T6-100%, T7-CONTROL)

Germination percentage calculation

Germination % = (seeds germinated / total seeds) * 100

Results and Discussion

Data in Table (1) showed that amongst all Azolla fertilizer extracts 30% concentration showed the maximum increase in seed germination, compared to control and other Azolla biofertilizers extract. Seed germination was ranged from 65- 80% and there were significant differences in the seed germination among different Azolla treatments. Maximum seed germination of 80% was recorded in the petriplates incorporated with 30% of Azolla followed by 75%, 70%, and 65% of seed germination.

Table (1) Effect of azolla extract on germination of tomato (Petri plate data observation)

S. No	Treatment	Number of seeds sown	Seeds germinated	Germination %
1	T1	20	14	70
2	T2	20	15	75
3	T3	20	16	80
4	T4	20	15	75
5	T5	20	15	75
6	T6	20	14	70
7	Control	20	13	65

Data in Table (2) revealed that all growths parameters were greatly affected by Azolla biofertilizers extract and foliar application. 30% Azolla biofertilizer concentration expressed the highest effect on all growth parameters compared to control. Values for growth parameters were 5.0 cm, 5.03 cm, 5.92 cm, 6.20 cm, 6.22 cm, 7.00 cm, and 7.90 cm for shoot length. The whole data revealed that tomato grown in 30% Azolla Biofertilizer extract and foliar application showed a great effect on all growth parameters and germination percentage.

Table (2) Effect of azolla extract on growth of shoot length and root length of tomato

S.no	Treatment	Shoot length (in cm)	Root length (in cm)
1	T1	5.03	6.83
2	T2	5.92	7.00
3	T3	7.90	8.26
4	T4	7.00	8.13
5	T5	6.20	6.96
6	T6	6.26	7.06
7	Control	5.90	6.16

Petri plate observation

Tomato contains strong antioxidant properties; Lycopene which is a red pigment responsible for antioxidant effects according to many studies (Voutilainen et al. 2006, Chen et al. 2013, Joanna Fiedor and Kvetoslava Burda, 2014). *Azolla sp* played an important role in maximize the effect of valuable antioxidant properties with its valuable components of Vitamins, Beta carotene, growth promotors and minerals which in turn help tomato fruits to have many advantages (Marwaha et al. 1992, Wagner 1997)

Conclusion

Azolla sp used for tomato growth along with foliar application; the best results were shown in 30% Azolla biofertilizer extract. Germination percentage, root length and shoot length were tested in this study and showed a highly significant difference compared to control group

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