INTERNATIONAL JOURNAL OF SCIENCE AND NATURE

www.scienceandnature.org

EFFECT OF BIOFERTILIZERS ON NUTRITIONAL CHARACTERISTICS IN *AONLA* SEEDLINGS AND GRAFTED PLANTS

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ABSTRACT
The current experiment effect of biofertilizers on nutritional status of Aonla seedlings had shown that treatment of biofertilizers with different combination show their different effects. The combination of *AMF + Azospirillum* enhances higher morphological growth performance than other combination. The *AMF + Azospirillum* applicated seedlings produce more leaves and shoot length which could have increase the rate of photosynthesis. In this evident from the finding that the nutritional status might be attribute to enhance inorganic and organic nutrient absorption by biofertilizers which in turn make the essential nutrient available to the promoting growth and increase nutrient content in leaves. The factor leads to increased photosynthetic surface area there by indicating the sufficient utilization of solar radiation ultimately leading to production of assimilates.

KEYWORDS*:* Biofertilizers, morphological growth, *Azotobacter, PSB, Aonla*

INTRODUCTION

Aonla (*Emblica officinalis Gaertn.*) is also known as Indian gooseberry is one of the most important indigenous fruit of arid-tropics which has high nutritional and medicinal values and very useful in restoring the health vitality and curing of number of body ailments. It is considered to be the second richest source of vitamin-C, 600 mg/100g next to barbedose cherry and it also contains high amount of minerals, *i.e.* iron, calcium and phosphorus. A number of value added processed fruit products, herbal and cosmetic products are manufactured from the fruits. In India, its cultivation has been practiced since ancient times, which is described in religious literature "Charak Samhita" and "Sursherut Samhita", Kalidas, Boudhist, manuscripts and other ancient literatures Anonymous (1964).The cultivation of Aonla is widely distributed all over the country varying from rainfed drought prone areas, arid and semi-arid tropical and subtropical regions. Besides India, it widely grows in China and Srilanka. Aonla is considered to be high tolerance potential fruit species which is most suited to grow under salt-affected and wasteland/ravine lands and foothills with little investments and high economic returns. The maximum area under Aonla cultivation is distributed in Uttar Pradesh, but a large area of Aonla cultivation expanded during the last 10 years in different parts of country, particularly in Maharashtra, Madhya Pradesh, Chhattisgarh, Rajasthan, Gujarat, Karnataka, Andhra Pradesh, Orissa, Himanchal Pradesh, Delhi, Haryana and Punjab. The term 'mycorrhiza' refers to the association between fungi and roots. This association is usually considered a mutualistic symbiosis because of the highly interdependent relationship established between both partners, where the host plant receives mineral nutrients *via* fungal mycelium (*mycotrophism*), while the heterotrophic fungus obtains carbon compounds from the host's photosynthesis. During the process of mycorrhiza formation, in which the plant 'accepts' the fungal colonization without any significant rejection reaction, a series of root-fungus interactions give way to the integration of both organisms. This in turn, leads to the development of a well adapted 'unity' within the context of the soil-plant ecosystem. Despite the scarcity of experimental information, it has been accepted that the establishment of the symbiosis must be the result of a continuous molecular 'dialogue' between plant and fungus, as exerted through the exchange of both recognition and acceptance signals. The result of this dialogue will finally depend on the genome expression of both partners (Smith and Gianinazzi1988). The fungus, in fact, becomes an integral part of the root system. The other biofertilizer like PSB, *Azospirillum, AMF* etc. help in fixation of various nutrients. *Aonla* seeds are shown in raised bed or polybags, subsequently, after10-12months, when seedling attains the lead pencil thickness then it is allowed for vegetative propagation. It takes more time for maturity of seedling for grafts. This time taking period may be shortened due to treatment of *AMF* because *AMF* can help uptake of macro and micro nutrients; thereby improve vegetative growth. Another problem, which is very frequently encountered in propagation of *Aonla*, is mortality of a significant proportion of grafted or budded plants, which ultimately add to total production cost. In *Aonla*, grafted and budded seedling survival percentage varied from 80-90% Kumar (2003). The plant survival is less due to poor uptake of macro and micro nutrients like Phosphorus, Manganese, Zinc etc. When budded and grafted plants are treated with *AMF*, it can help increase uptake of macro and micro nutrients. However, some micronutrients like Zinc helps in formulation of *Auxin*, and *AMF* will be able to enhance the absorption of nutrients from soil. Auxin might favour early graft healing and

development of better grafts union. Therefore, survival percentage, nutrient uptake and growth performance of vegetatively and seedling propagated *Aonla* plants can be increased by inoculation with *AMF* and biofertilizers.

MATERIALS & METHODS

The experiment was carried out in year 2011-2012 at Biotech Networking Facility Centre, Science and Technology Centre, Bakshi Ka Talab, Lucknow. The experimental site situated at 26.98^0 latitude and 80.92 longitudes at elevation of 124 meters from above mean sea level. In this experiment, there were two a type planting material used that is seedling and grafted, four biofertilizers, soil media and earthen pots under natural environmental condition. The planting material of uniform height and girth was selected from nursery. Two months old seedling and grafted plants were used. The patch budding grafted plants were used in experimental study. The length of patch budded sprouted shoots also in uniform size. The selected planting materials were shifted to earthen pots. The different types of bio-fertilizers / culture were collected from different institutions, *AMF* culture from IARI, New Delhi, *Trichoderma* and *PSB* sample from NBRI, Lucknow and *Azospirillum* culture collected from the Bio- tech park, Lucknow. All these culture media used before expiry date. The soil media used in experiment was prepared by soil and FYM with in ratio of 1:1. The measured quantity of biofertilizers was mixed properly in soil media. The biofertilizers used in above experiments for filling in the pots was as 30 gm in single biofertilizers and in combination of two biofertilizers was 60 gm (30gm each). The above biofertilizers in single or in combination was mixed with soil media and left over a night. In next day pots were filled with the mixture of soil media and biofertilizers and also in same day transplanting of seedling and grafted plants were done. The total 32 mature leaf sample after 120 days were collected from seedling and grafted plants. The nutritional estimation of leaf was done in Laboratory. Data recorded in all observations will be analyzed statistically and treatments will be compared with the help of critical differences technique described by Panse and Sukhatme (1985) and result will be evaluated at the 5% level of significance.

RESULTS AND DISCUSSION

The result obtained from the experiment, indicate that different combination of biofertilizer (Table-1) was significant as compared to non treatments of plants. The highest seedling growth was recorded by using of *AMF+ PSB* followed by *AMF+Azospirillum* respectively. As (Table-2) revealed that the highest seedling growth was recorded by using of *AMF+Azospirillum* followed by *PSB* and *AMF+PSB* respectively. In is evident from the finding that the Nutritional status might be attribute to enhance inorganic nutrient absorption and due to the N_2-fixation by *Azospirillum* and P by *AMF* which in turn make the essential nutrient available to the promoting growth and increase nutrient content. The similar result also been reported by Haggag and Azzazy (1996) in Mango seedlings Patel *et al* (2008), Suresh and Hasan (2001) in banana. One the contrary control recorded poor nutrient content in leaf. The factors lead to decreased photosynthetic surface area there by indicating the inefficient utilization of solar radiation ultimately leading to lower production of assimilates. Fidelibu *et al.,* (2000) in citrus and Rajadurai and Beaulah (2000) in marigold revealed that the nutritional parameter were affected significantly due to application of *AMF*.

TABLE 1: Effect of Bio fertilizers on Nutritional Status in Aonla Seedling Plants.

Treatments	2011			2012		
Control	N	P	K	N	P	K
AMF	1.411	0.131	0.551	1.422	0.134	0.573
Azospirillum	1.432	0.133	0.572	1.429	0.138	0.581
Trichoderma	1.437	0.134	0.579	1.457	0.141	0.590
PSB	1.417	0.132	0.558	1.424	0.135	0.577
AMF+Azospirillum	1.546	0.151	0.783	1.578	0.154	0.788
AMF+ PSB	1.590	0.152	0.893	1.622	0.157	0.813
AMF+ Trichoderma	1.539	0.149	0.689	1.541	0.149	0.693
control	1.490	0.142	0.611	1.490	0.146	0.611
SE	0.0112	0.0018	0.0063	0.0113	0.0020	0.0093
CD (0.05%)	0.0219	0.0036	0.0122	0.0238	0.0038	0.0190

TABLE 2: Effect of Bio fertilizers on Nutritional Status in Aonla Grafted Plants

Treatments	2011			2012		
	N	P	K	N	P	K
Control	1.431	0.137	0.562	1.433	0.138	0.566
AMF	1.434	0.141	0.583	1.447	0.144	0.571
Azospirillum	1.458	0.148	0.590	1.456	0.153	0.590
Trichoderma	1.432	0.138	0.568	1.434	0.141	0.569
PSB	1.581	0.159	0.797	1.586	0.162	0.842
AMF+Azospirillum	1.691	0.162	0.857	1.713	0.164	0.885
AMF+ PSB	1.574	0.152	0.691	1.576	0.158	0.697
AMF+ Trichoderma	1.46	0.149	0.611	1.476	0.157	0.622
SE	0.0003	0.0024	0.0088	0.0002	0.0026	0.0077
CD (0.05%)	0.0142	0.0052	0.0183	0.0193	0.0061	0.0154

ACKNOWLEDGEMENT
The authors are thankful to Director, Remote Sensing Application Centre, Lucknow for providing necessary material.

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