
Influence of *Trichoderma harzianum* on carboxylation efficiency of *Amorphophallus paeoniifolius*

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Trichoderma harzianum a soil borne fungus was found to improve crop vigour, disease resistance and yield of many cultivated crops. *Amorphophallus paeoniifolius* is commonly called as elephant foot yam, which has potential to yield 40-50 tonnes tuber per ha. A field experiment was conducted to study the influence of *T. harzianum* on photosynthesis and carboxylation efficiency of elephant foot yam. Net photosynthesis was measured using LCA-4 (ADC, UK) photosynthesis system at 90 and 120 days after planting. The results indicated that increased net photosynthesis rate (Pn) in *T. harzianum* treated field at all stages compared to untreated field. However, higher percentage (29.1%) increase of net photosynthesis rate was noticed at later stage (120 days after planting), when environmental stress was higher. Similarly *T. harzianum* treated plants maintained higher intercellular CO₂ concentration (Ci) than untreated plants. The carboxylation efficiency derived from Pn and Ci values indicated that there was considerable increases in carboxylation efficiency when *T. harzianum* was applied to elephant foot yam. However, its effect was more pronounced at later stage. Thus the present investigation indicated that application of *T. harzianum* increased photosynthesis rate and carboxylation efficiency that in turn enhanced plant vigour and dry matter yield of elephant foot yam.

Key words : *Amorphophallus paeoniifolius*, carboxylation efficiency, photosynthesis rate

Elephant foot yam (*Amorphophallus paeoniifolius*) is a popular tuber crop in South East Asia. In India it is grown in all the states. It is grown for its delicious tuber. Tubers are consumed as vegetable after boiling and baking. This crop has the yield potential of 40-50 tonnes/ha. Being a high yielding crop it requires high amount of plant nutrients. Biofertilizers are the alternate cheap source of plant nutrients and also environmentally safe. *Trichoderma harzianum* a soil borne fungus was found to improve crop vigour and yield (Sriram and Ray, 2005) apart from disease control (Mathew and Gupta, 1998) in many of the cultivated crops. Colonizing of *T. harzianum* on the root cortex also helps the plants for better photosynthesis, vigour and yield. Keeping in view of the above, an investigation has been carried out to find the effect of *T. harzianum* on growth and yield of elephant foot yam.

A field experiment was conducted to study the effect of *Trichoderma* on elephant foot yam growth and

yield at Regional Centre of Central Tuber Crop's Research Institute, Bhubaneswar. The treatment consisted of *T. harzianum* treatment and control (no treatment). The treatments were replicated five times. As aliquot 5 g. of *T. harzianum* was treated with one kg of tuber. The treated tubers were shade dried 2 hrs before planting. All other recommended package of practices were duly followed.

Photosynthesis rate was measured at 90 and 120 days after planting (DAP) with LCA-4 (ADC, UK) photosynthesis system. Carboxylation efficiency was calculated as mentioned below :—

Carboxylation efficiency = Pn/Ci; where, Pn = Net photosynthetic rate; and Ci = Net intercellular CO₂ concentration

The results indicated that net photosynthesis rate (Pn) increased at all stages in *T. harzianum* treated field compared to untreated field (Table 1). However, higher percentage (29.1%) increase of net

photosynthesis rate was noticed at later stage (120 days after planting), when environmental stress was higher. Similarly *T. harzianum* treated plants maintained higher intercellular CO₂ concentration (Ci) than untreated plants. The carboxylation

efficiency derived from Pn and Ci values indicated that there was considerable increased in carboxylation efficiency when *T. harzianum* was applied to elephant foot yam (Table 1). However its effect was more pronounced at later stage. Higher

Table 1 : Effect of *Trichoderma harzianum* on photosynthesis of elephant foot yam

Treatment	Net photosynthesis (Pn)		Intercellular CO ₂ concentration (Ci)		Carboxylation efficiency	
	90 DAP	120 DAP	90 DAP	120 DAP	90 DAP	120 DAP
<i>T. harzianum</i>	14.25±0.04	6.25±0.01	316.2±2.6	263.1±1.4	0.045±0.001	0.024±0.002
Control	12.76±0.02	4.84±0.02	305.7±2.1	259.1±1.8	0.042±0.003	0.019±0.001

±Standard deviation

Table 2 : Influence of *Trichoderma harzianum* on growth and biomass of elephant foot yam

Treatment	Plant height (cm)		Biomass (g/plant)	
	90 DAP	120 DAP	90 DAP	120 DAP
<i>T. harzianum</i>	102±8	146±5	309±9	815±10
Control	86±5	118±3	256±4	685±7

± Standard deviation

plant height and biomass production was noticed with the application of *T. harzianum* at 90 and 120 DAP (Table 2). The increased growth and biomass production was due to higher photosynthesis rate and carboxylation efficiency (Table 1).

Thus the present investigation indicated that application of *T. harzianum* increased photosynthesis rate and carboxylation efficiency that in turn enhanced plant vigour and dry matter yield of elephant foot yam.

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