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Impacts of biostimulant (*panchagavya*), etiolation and media on seed germination and morphological and biological traits of Coconut (*Cocos nucifera* L.) cv. ALR-1

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Abstract

Impacts of biostimulant, *viz*., water soaking, 3%, 5% and 7% *panchagavya,* etiolation for 10, 20 and 30 days and different media on seed germination and morphological and biochemical traits of Coconut (*Cocos nucifera* L.) cv. ALR-1 were assessed. Water soaking for thirty days increased seed germination and other growth related attributes. When the water soaked seed nuts were sown in different combinations of rooting media *viz.,* vermicompost, coir compost and sand, better germination was observed in the water soaked nuts sown in sand + vermicompost (3:1) medium.

Keywords : biostimulant, coconut, coir compost, etiolation, vermicompost

INTRODUCTION

Coconut is valued both for its matured and tender nut which have components such as coconut milk, kernel, shell and husk. It is a perennial crop that exhibits considerable genetic variations and is being propagated only through seeds (Thampan, 1982). If the seedlings happen to be unselected and inferior in quality, the garden will prove to be highly uneconomical. Planting vigorous seedlings is a pre requisite to avoid such situations. Hence, an attempt was made to study the impacts of biostimulant, etiolation and media on seed germination and other traits of Coconut (*Cocos nucifera* L.) cv. ALR-1 at Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore -3, South India.

MATERIALS AND METHODS

A field experiment was conducted with coconut cv. ALR-1 during 2005-2006 at Horticultural College and Research Institute, Tamil Nadu Agricultural University, Coimbatore, South India. There were eight treatments *viz,* T_1-water soaking, T_2- *3% panchagavya*, T_3- *5% panchagavya,* T_4 - *7% panchagavya*, T_5 - etiolation of seed nuts in total darkness to increase the possibility of root initiation for 10 days, T_6 - etiolation for 20 days, T_7 - etiolation for 30 days and T_8 - control. All the treatments were replicated thrice in a randomized block design. During etiolation, starch reserve level would drop and result in softening of tissues and there will be rise in auxin level and undifferentiated tissue begins to form. In vegetative propagation of many horticultural crops etiolation is employed to induce more production of auxin level so as to improve the root initiation. eg., etiolation of graft joints. The same method has also been extended to seed propagated crops to improve seed germination. With this concept, the selected seed nuts of coconut were covered with dried coconut leaves, to create the effect of etiolation (darkness) on the seed nut for a period of 10 days, 20 days and 30 days as per the treatments. Observations on growth characters were recorded from randomly selected plants. To the treatment which showed best results, a second set of experiment with different combinations of rooting media *viz,*. Sand + soil (1:1) (T_1), Sand + vermicompost (3:1) (T_2), soil + vermicompost (3 :1) (T_3), Sand + coir compost (3 :1) (T_4), Soil + coir compost (3:1) (T_5), Water soaking + sand + soil (1:1) (T_6), water soaking + sand + vermicompost (3:1) (T_7), Water soaking + soil + vermicompost (3:1) (T_8), water soaking + sand + coir compost (3:1) (T_9), Water soaking + soil + coir compost (3:1) (T_{10}) and Control (T_{11}) were tried.

Panchagavya preparation

Panchagavya is a biostimulant consisting of a combination of five products obtained from cow, which includes cow dung, urine, milk, curd and ghee. The term *panchagavya* represents '*Pancha*'-five, '*Gavya*'-cow produce.

Panchagavya acts as an immuno stimulant as that of cow urine and promotes growth due to the presence of cow dung and thereby increases the overall yield and renders resistance to diseases and pests.

The materials required and the methodology involved in the preparation of *panchagavya* is furnished below:

Materials required

1.	Fresh cow dung	-	5 kg
2.	Cow's urine	-	3 litre
3.	Cow's milk	-	2 litre
4.	Curd	-	1 litre
5.	Ghee	-	1 litre
6.	Sugarcane juice	-	3 litre

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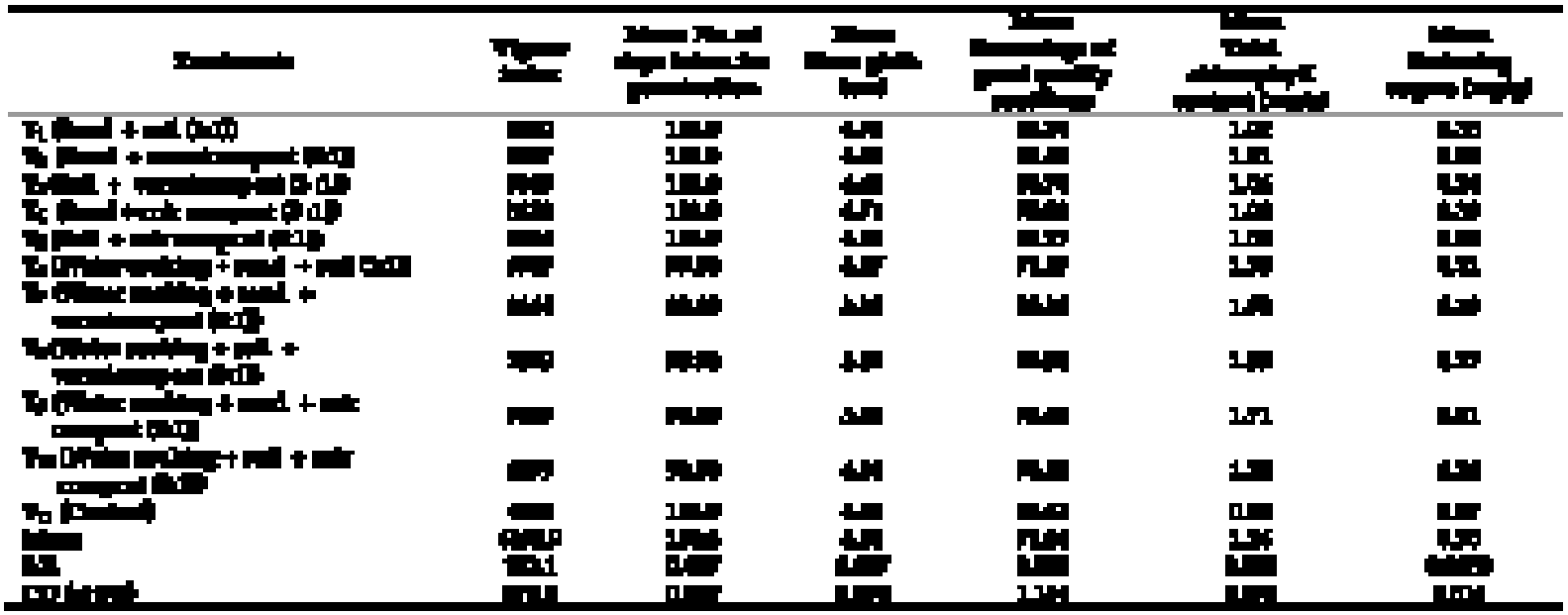
Table 1. Effects of biostimulant and etiolation on seed germination and morphological and biochemical traits of Coconut *Cocos nucifera* L. cv ALR-1

Treatments	Mean No. of days taken for germination	Mean Stem girth (cm)	Mean Seedling height (cm)	Mean Percentage of germination	Mean Total chlorophyll content (mg/g)	Mean Reducing sugars (mg/g)
T_1 (Water soaking)	93.40	5.60	59.80	93.30	1.89	0.25
T_2 (3% *panchagavya*)	96.80	5.20	53.70	88.60	1.48	0.32
T_3 (5% *panchagavya*)	98.60	5.10	51.30	83.70	1.14	0.41
T_4 (7% *panchagavya*)	99.40	5.20	47.40	77.40	1.05	0.39
T_5 (Etiolation 10 days)	101.90	4.90	40.10	71.20	1.09	0.37
T_6 (Etiolation 20 days)	105.70	4.60	52.30	74.30	1.28	0.42
T_7 (Etiolation 30 days)	108.30	4.80	48.90	72.80	1.02	0.45
T_8 (Control)	109.60	4.40	43.70	69.80	0.91	0.52
Mean	101.70	4.97	49.65	78. 88	1.23	0.39
S.E.	0.646	0.043	0.688	0. 976	0.036	0.008
CD (at 5%)	1.385	0. 093	1.477	2. 095	0.078	0.019

ALR-1



(or) Jaggery 500 g in 3 litre of water

7. Tender coconut water- 3 litre
8. Ripe banana - 12 nos.
9. Toddy (if available) - 2 litre

Fresh cow dung 5 kg and a litre of ghee mixed well manually and retained in a plastic bucket for three days under shade. It was stirred once in a day and then on the fourth day the remaining ingredients were added to the mixture, mixed well and transferred to a wide mouth pot or cement or plastic container covered with a wire mesh and maintained under shaded condition. The slurry was mixed well three or more times a day up to the 15th day. Thus the stock solution of *panchagavya* was ready for use in a time of 15 days which was diluted to three per cent and then sprayed. By stirring regularly, the stock solution can be kept for six months. However, the *panchagavya* refers to the five cow products alone, the other ingredients being added as additives for enhancing fermentation and to improve the quality of the *panchagavya* (Natarajan, 2000).

Estimation of total chlorophyll content (Yoshida *et al*., 1971)

Chlorophyll content in the leaf was estimated at the fourth, fifth, sixth month after sowing. A leaf sample of 250 mg was taken and ground with 10 ml of acetone with pestle and mortar. The homogenate solution was centrifuged 5000 rpm for 10 minutes. The supernatant was collected and the volume was made upto 25 ml using 80 per cent acetone. The optical density of the content was measured at 652 nm for total chlorophyll content and expressed as milligram per 100 g.

$$\text{Total chlorophyll} = 20.2 \times (A\ 645) + 8.02 \times (A\ 663) \times \frac{V}{1000 \times W}$$

Where

A = absorbance at specific wave length

V = final volume of chlorophyll extract in 80 per cent

acetone

W = fresh weight of tissue extract

Estimation of reducing sugars (Somogyi, 1952)

To one ml of leaf sample extracted with acetone, one ml of copper reagent was added and boiled for 15 minutes. After cooling this mixture in running water, one ml of Nelson's arseno molybdate reagent was added for colour development and the final volume was made upto 10 ml with distilled water. The intensity of colour was measured as optical density (OD) value in spectrophotometer at 620 nm. The amount of sugar was calculated against glucose standard and expressed as mg per g.

RESULTS AND DISCUSSION

Impact of biostimulant and etiolation on seed germination and other traits of Coconut

Seed nuts soaked in water (T_1) registered the lowest number of days for germination, highest chlorophyll content, seedling height, stem girth and percentage of germination (Table 1). The reason for early germination of water soaked nuts might be due to the stimulation of the embryo by the dilutionary effect of the growth inhibitors as the soaking of coconut seed nut would facilitate the absorption of more amount of moisture through outer husk or due to the leaching out of water-soluble inhibitors caused by the additional imbibition of water (Thomas, 1973). In addition at the same time it might have initialized the production of growth promoting substances also which were already present in the nut. Menon and Pandalai (1960) also found that soaking of the seed nuts in water for a period of 15 days resulted in quicker and better germination. Bagade and Shinde (1993) also evidenced that water soaking of clove seeds for 24 hours resulted in higher germination percentage when compared to other chemical treatments. Next to water soaking (T_1), seed nuts soaked in three per cent *panchagavya* (T_3) was found to be beneficial. This might be due to the presence of growth regulators like auxin, synthesized by microorganism present in *panchagavya* as opined by Xu *et al*. (2000).

The highest reducing sugar content was recorded in the control treatment. This could be explained by the fact that reducing sugar content is generally negatively correlated with seed germination. Presence of reducing sugars may affect the viability of seeds through Amadori and Millard reaction, which involves simple non-enzymic attack by reducing sugars on amino groups resulting in protein break down and consequent poor germination (Nursten and O'Reilly, 1986; Wettlaufer and Leofold, 1991).

Impact of different combinations of media on seed germination and other traits of Coconut

Significant differences were observed in the treatment media containing water soaking, sand and vermicompost in 3:1 ratio (T_7) with regard to days taken for germination, vigour index, stem girth, days taken for first leaf emergence and percentage of good quality seedlings (Table 2). This could be due to the media *i.e.* vermicompost that contains more micronutrients, macronutrients and nitrogen fixing organisms (Bano *et al*., 1987). These results were also supported by Hidalgo (1997) who evidenced that germination percentage and further growth of cucumber seedlings increased upon seed treatment with vermi cast.

The highest total chlorophyll content was observed in the plants grown in the media containing water soaking, sand and vermicompost in 3:1 ratio (T_7). The pos-

sible reason for high chlorophyll content in the leaves of the plant in this treatment (T_7) might be the better availability of nutrients and effective conversion of the nutrients such as iron (Fe), magnesium (Mg), and nitrogen (N), at the site of photosynthesis into pigments.

The highest reducing sugar content was registered in control (T_{11}). The possible reason for accumulation of reducing sugars might be due to the effect of reducing sugars on amino acid, which could have caused protein inactivation and DNA damage (Nursten and O'Reilly, 1986) and led to poor germination of seedlings.

CONCLUSION

Results of the present study strongly supported that water soaking and vermicompost treatments are essential to improve germination and further growth of seedlings in coconut.

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