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## Response of bio-enhancers on rooting of hard wood cuttings of bougainvillea (*Bougainvillea glabra* L.) var. Shubhra

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### Abstract

The present investigation entitled “Response of Bio-enhancers on Rooting of Hard Wood Cuttings of Bougainvillea (*Bougainvillea glabra* L.) var. Shubhra.” was carried out during winter season (February month) of 2020-21 at IFTM University; Moradabad (U.P.) The experiment was laid out in Completely Randomized Design along with six Different combinations of *Panchagavya* (4%) *Jivamrita* (30%) and Vermiwash (10%) with control as treatments. On the basis of the analysis of results, it is found that treatment combination of *Panchagavya* (4%) + Vermiwash (10%) proved as a potential input for different parameters recorded such as days to first sprout (16.4), no. of vegetative buds at 30DAP (6.10), No. of vegetative buds at 60DAP (7.70), length of longest shoot (7.55cm) at 30DAP Length of longest shoot (cm) at 60DAP (20.15cm), Length of longest root (cm) at 30DAP (13.85cm), Length of longest root (18.25cm) at 60DAP, no. of leaves/cutting at 30DAP (10.20), no. of leaves/cutting (13.90) at 60 DAP, survival percentage (95.40%) at 30DAP, survival percentage (94.40%) at 60DAP amongst the various treatment combinations of bio-enhancers.

**Keywords:** Bio-enhancers, *Panchagavya*, *Jivamrita*, vermiwash, bougainvillea

### Introduction

Bougainvillea is a very popular evergreen landscape plant in tropical and subtropical areas. Bougainvillea (*Bougainvillea glabra*) a member of the family *Nyctaginaceae* is native to eastern South America and has chromosome no. ( $2n = 34$ ). Bougainvillea growth habit and beautiful showy bracts make it a popular plant for landscape. It is used in mass plantings, as shrubs or bushes and as ground cover on banks. Bougainvillea provides hedges, barriers and slope coverings. For large, difficult-to-maintain areas, Bougainvillea is an excellent ground cover. It can cover a whole hillside and will choke out weed growth. Vegetative propagation of bougainvillea through stem cutting is one of the cheapest methods for multiplication. The modernization and urbanization have enhanced the use of bougainvillea, because landscape horticulture is getting lot of attention and also high in demand due to large-scale plantation in urban areas, drought and pollution tolerant, low maintenance requirement in comparison to other plants and various uses (Babita, *et al.* 2017) [1]. There are huge requirements for some inputs which can enhance the rooting of the cuttings of bougainvillea which are difficult to root in normal conditions. Various hormone like auxins such as Indole Acetic Acid (IAA), Indole Butyric Acid (IBA), Naphthalene Acetic Acid (NAA) and 2,4- Dichlorophenoxy Acetic Acid (2,4-D) have been reported to promote rooting in cuttings (Baraskar *et al.* 1990) [2]. These are available in different forms in the market but they are very expensive which makes it difficult to afford to the growers and nurseryman for propagation.

Bio-enhancers are organic preparations, obtained by active fermentation of animal and plant residues over specific duration. These are rich source of microbial consortia, macro- and micronutrients and plant growth promoting substances including immunity enhancers (Pathak 2010) [6]. *Panchagavya* is a special bio-enhancer prepared from five products obtained from cow i.e. dung, urine, milk, curd and ghee. These are properly mixed and incubated for recommended period to get ready. This preparation is rich in nutrients, auxins, gibberellins and microbial fauna and acts as tonic to enrich soil induce plant vigour with quality production. The meaning of *Jivamrita* is the ‘Nectar of life’. *Jivamrita* popularized by Sh. Subhash Palekar, is considered to be a panacea for the prosperity of small farmers. It is important to provide a congenial environment to microorganisms that help in making available essential

nutrients for plant growth, viz. nitrogen, phosphorus and potassium (N, P and K) to the plants. *Jivamrita* provides an environment to beneficial microbes. Application of *Jivamrita* to soil improves the soil microbial health considerably. It also encourages rooting as it has some important root promoting hormones (Trivedi *et al.* 2016) [11]. Vermiwash is a liquid leachate obtained by excess water to saturate the vermi composting substrate. It is collection of excretory products and mucus recreations of earthworm along with nutrients from the soil organic molecules. In fact, vermiwash is an enriched bio-enhancer prepared from the heavy population of earthworms reared in earthen pots/plastic or cement containers. It contains hormones (gibberellins and cytokinins) secreted by the earthworms (Zambare *et al.* 2008) [13]. Bio-enhancers like *Panchagavya*, *Jivamrita* and Vermiwash are the rich source of plant growth regulators especially auxins. At the same time these can be prepared with the very little infrastructure facility and some hands on practice at the farm only. Thus they are very cheap and affordable for the farmers and growers to use it as input to enhance the rooting of bougainvillea. Considering the huge demand and necessity to availability of cheap and affordable alternative of synthetic rooting hormone the present investigation was therefore, undertaken to find the response of bio-enhancers on rooting of hard wood cuttings of bougainvillea (*Bougainvillea glabra* L.) var. Shubhra.

### Materials and Methods

The present research was carried out to study the effect of different Bio-enhancers on rooting of hardwood cuttings of Bougainvillea (*Bougainvillea glabra*) var. Shubhra in spring season of 2021 at experimental farm, School of Agricultural Sciences, IFTM University, Moradabad located on 28.8186° N and 78.6425° E longitude and has altitude of about 193.23 meter above the mean sea level. The experiment was conducted with different combinations of bio-enhancers like *Panchagavya* (4%) *Jivamrita* (30%) and Vermiwash (10%). The hardwood cuttings (20cm, pencil thickness) of *B. glabra* cv. Shubhra were prepared and planted in polythene bag under 50% shade net house. Irrigation was applied with the help of watering cane as per the requirement. Bio-enhancers were applied four times. *Panchagavya*, *Jivamrita* and Vermiwash were drenched in the media. Bio-enhancers (*Panchagavya*, *Jivamrita* and Vermiwash) were prepared on the field itself by using the standard procedures (Pathak *et al.* 2013). For preparing 20 liters of *Panchagavya*, 5 kg fresh cow dung and 500 g cow's ghee were mixed thoroughly in a mud pot and kept for three days. This mixture was mixed twice a day. On the 4 day, cow's urine (3 liters), cow's milk (2 liters), cow's curd (2 liters), sugarcane juice (3 liters), tender coconut water (2 liters) and meshed ripened 6 banana fruits were mixed thoroughly. This solution was kept for 18 days with stirring twice a day for about 20 min to facilitate aerobic microbial activities. On the 19th day, the stock solution of *Panchagavya* was ready to use. The solution was kept under the shade and covered with a muslin cloth so that common fly could not sit on it and lay eggs. In the preparation of *Jivamrita*, the required quantities of fresh cow dung and cow urine were mixed thoroughly in 200 liters of water in a mud

pot followed by addition of 4 liters of sugarcane juice, 2 kg pulse flour and 1 kg of virgin soil (chemical free soil). This solution was stirred well and kept for 3 days for fermentation under shade. The pot of *Jivamrita* solution was covered with a muslin cloth to avoid any undesirable contamination. After 3 days of fermentation, solution of *Jivamrita* was prepared and was used according to treatments. Vermiwash was prepared in a big plastic drum with capacity of 200 liters (provided with tap in bottom) that was placed in the shade. Five cm each of concrete and red sand was laid in bottom of pot for effective drainage. A layer of soften kitchen wastes and one week old dung was filled 30-40 cm in the pot and then 200-300 red worms (*Eisenia foetida*) were released in this organic waste and dung. After a week of worm inoculation, an earthen pot with minute hole in bottom from where water pours drop wise was hanged over drum. After 2-3 days, extract collected from tap provided in the bottom of pot/drum obtained as 'Vermiwash' and was used in different concentrations. Hand weeding was done to keep the cuttings free from weeds and the cuttings did not show incidence of any disease. The experiment was laid out in completely randomized design with three replications to determine the statistical significance of treatment effects. Differences were considered significant at 5% level of significance.

### Results and Discussion

Observations were recorded on parameters viz., Days to first sprout, No. of vegetative bud/cutting at 30DAP, No. of vegetative bud/cuttings at 60DAP, Length of longest shoot (cm) at 30 and 60DAP, Length of longest root (cm) at 30 and 60DAP, No. leaves/cuttings at 30 and 60 DAP, Survival percentage at 30 and 60 DAP were statistically analyzed the results with discussion are present here:-

#### Effect of Bio-enhancer on Various Parameters

As per the data revealed the earliest sprout was obtained in the treatment *Panchagavya* (4%) + Vermiwash (10%) with 16.4 days. The maximum number of vegetative bud/cutting at 30DAP (6.10) and 60DAP (7.70) was obtained in the T<sub>4</sub> (*Panchagavya* (4%) + Vermiwash (10%). The longest shoot measured at 30 days after planting was 7.55cm and at 60 DAP 20.15cm in the cuttings treated with the *Panchagavya* (4%) + Vermiwash (10%). Data revealed that the longest root 13.85cm at 30 and 18.25cm at 60DAP was observed in the treatment T<sub>4</sub> that is *Panchagavya* (4%) + Vermiwash (10%). The maximum number of leaves/cutting at 30 and 60DAP was recorded 10.20 and 13.90, respectively was counted in the T<sub>4</sub> (*Panchagavya* (4%) + Vermiwash (10%). The effect of bio-enhancers on survival % at 30 and 60 DAP was recorded and as per data the maximum survival (95.40%) and (94.40%) was observed in T<sub>4</sub> (*Panchagavya* (4%) + Vermiwash (10%) at 30 and 60 days after planting.

Vermiwash and *Panchagavya* plays an important role in the plant growth and development; contribute to initiation of rooting, root growth, plant development, promotion growth rate and improvement in crop production increasing the soil organic matter and increase in nutrient content which are readily available for the plants, resulting in good crop yield.

## Effect of Different Bio-enhancers on Rooting of Cutting of Bougainvillea

Treatments	Effect of Different Bio-enhancers on Rooting of Cutting of Bougainvillea										
	Days to First Sprout	No. of Vegetative Buds per cutting		Length of Longest Shoot (cm)		Length of Longest Root (cm)		No. of Leaves per Cutting		Survival percentage	
	Days	30 DAP	60 DAP	30 DAP	60 DAP	30 DAP	60 DAP	30 DAP	60 DAP	30 DAP	60 DAP
T <sub>0</sub> (Control)	19.40	2.80	2.20	1.60	1.85	1.50	2.70	2.90	5.00	27.20	25.90
T <sub>1</sub> ( <i>Panchagavya</i> 4%)	16.90	2.30	2.80	1.90	2.95	2.65	3.90	4.50	6.50	34.10	34.10
T <sub>2</sub> ( <i>Jivamrita</i> 30%)	16.60	2.10	2.20	1.60	2.70	1.80	3.15	3.90	6.70	36.70	36.70
T <sub>3</sub> (Vermiwash 10%)	19.10	3.00	3.90	2.00	3.50	6.70	9.35	5.10	7.70	60.30	60.30
T <sub>4</sub> <i>Panchagavya</i> (4%) + Vermiwash (10%)	16.40	6.10	7.70	7.55	20.15	13.85	18.25	10.20	13.90	95.40	94.40
T <sub>5</sub> <i>Jivamrita</i> (30%) + Vermiwash (10%)	19.50	5.30	5.80	4.60	6.40	8.95	14.15	7.20	13.20	73.70	73.70
T <sub>6</sub> <i>Panchagavya</i> (4%) + <i>Jivamrita</i> (30%)	18.10	3.40	3.40	2.50	3.90	2.75	6.05	5.80	8.50	67.70	60.70
C.D.	N/A	1.56	1.56	1.29	9.51	1.47	2.06	2.68	3.39	11.98	13.46

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