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Studies on rooting of cuttings of grapes (*Vitis vinifera* L.) using biofertilizers with special reference t wine varieties

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Abstract
The experiment was conducted at Division of Horticulture, Gandhi Krishi Vignana Kendra, University of Agricultural sciences, Bangalore, There were five varieties viz. Arka Kanchan, Arka Soma, Arka Thrishna, Bangalore Blue and Queen of Vine Yard consisting of ten treatments, the treatment consisting of *Trichoderma harzianum*, *Glomus mossae*, PSB and IBA, replicated five and tested in a factorial completely randomized design. The result revealed that maximum percentage of rooting was recorded in treatment T8 (92.86%) whereas, lowest rooting percentage was noticed in the treatment T10 (69.35%). Among the varieties maximum rooting percentage was recorded in Bangalore Blue (84.05%). However, least rooting percentage was noticed in Queen of Vine Yard (76.75%). in case of Interaction effect between the treatments and varieties maximum percentage of rooting recorded in T8 (95.31%). Whereas the least percent of rooting was noticed T10 (64.93%).

Keywords: grape varieties, biofertilizers, IBA and rooted cuttings

Introduction
Propagation is one of the most important aspects in horticulture. Vegetative propagation methods like cuttings, air layering, grafting and budding are being widely followed to raise plants of desired genetic constitution and to maintain their purity for commercial exploitation.
Grapes (*Vitis vinifera* L.) are one of the most important fruit crops of tropical and sub-tropical regions. It has been cultivated from time immemorial. Globally it occupies an area of 6976108 ha with an annual production of 68412467 MT. In India it has been cultivated in 1187000 ha with an annual production of 2585.3 MT. Propagation by stem cuttings is the commercial method followed in grapes root stock.... etc. Further, growth substances applied exogenously to cuttings are found to enhance early and good root formation.
Soil microorganisms have been differentiated according to their functions by soil microbiologists and microbial ecologists, as benefial and harmful. Benefial microorganisms are those that can stimulate plant growth by fixing atmospheric nitrogen, decomposing organic wastes and residues, enhance nutrient cycling, detoxifying pesticides, suppressing plant dieses and soil borne pathogens by producing bioactive compounds such as vitamins, hormones and enzymes. Using some of these beneficial microorganisms, various microbial inoculants have been prepared for use in crop propagation and production to reduce the cost on synthetic chemicals and to minimize environmental pollution. Since with use of synthetic chemicals and pesticides, they are now widely applied in eco technology. Microorganisms like *Trichoderma spp, Glomus spp* and some bacteria are reported to produce phytohormones (Constracerta and Vandelyden, 1995) which induce rooting of different plant species. These microorganisms can be employed in propagation of horticulture species (Amy *et al.*, 1995) [3].

Material and Methods
The present investigation on propagation of grapes (*Vitis vinifera* L.) using biofertilisers with special reference to wine varieties was carried out at Division of Horticulture, Gandhi Krishi Vignana Kendra, University of Agricultural sciences, Bangalore, which was situated at an elevation of 930 meters from mean sea level. Studies on the suitability of the microbial inoculants for multiplication of grapes through hard wood cutting were conducted in open field. There were five cultivars consisting of ten treatments, replicated five and tested in a

factorial completely randomized design. The varieties are Arka Kanchan, Arka Soma, Arka Thrishna, Bangalore Blue and Queen of Vine Yard were selected. The cuttings were prepared after the vines were back pruned during the month of april. After discarding the basal portion, lateral branches and leaves, medium thickness cuttings were prepared by giving a slant cut at lower end immediately below the bud, while the upper end was cut 0.75 to 2.0 cm above the bud. These cuttings were ready for the treatments and planted in the polybags.

The cuttings were uprooted carefully from the poly bag on 60th day after planting, washed thoroughly under running water and adhering sand particles were removed. Further percentage of rooting was calculated by using formula

$$\text{Percent of rooting} = \frac{\text{No. of cuttings rooted}}{\text{Total no. of cuttings planted}} \text{ X } 100$$

Treatment details

T_1: *Trichoderma harzianum* @ 10g/ kg of potting mixture
T_2: *Glomus mosseae* @ 10g/ kg of potting mixture
T_3: PSB @ 10g/ kg of potting mixture
T_4: *Trichoderma harzianum*+ *Glomus mosseae* each @ 05g/ kg of potting mixture
T_5: *Trichoderma harzianum* @ 05g/ kg of potting mixture+ IBA @1000 ppm.
T_6: *Glomus mosseae*+ PSB each @ 05g/ kg of potting mixture
T_7: *Trichoderma harzianum*+ *Glomus mosseae* + PSB each @ 05g/ kg of potting mixture
T_8: *Trichoderma harzianum*+ *Glomus mosseae* + PSB each @ 2.5g/ kg of potting mixture + IBA @1000 ppm.
T_9: Control IBA @ 1000 ppm
T_{10}:Absolute control (No IBA and no microbial inoculants)

Table 1: Effect of microbial inoculants on percentage of rooted cuttings

Treatments	Varieties					Mean
	Arka Soma	Bangalore Blue	Queen of Vine Yard	Arka Thrishna	Arka Kanchan	
T1	76.23	82.35	73.61	77.22	80.35	77.95
T2	74.71	79.85	70.64	75.40	78.58	75.80
T3	70.99	75.43	69.89	73.20	74.47	72.80
T4	86.33	85.26	78.43	80.70	85.60	83.15
T5	87.62	86.38	80.48	88.45	87.32	86.05
T6	81.89	84.20	75.63	78.36	81.22	80.26
T7	91.45	92.61	84.63	94.28	91.36	90.86
T8	93.26	93.83	87.03	95.31	94.89	92.86
T9	90.03	90.41	82.46	90.63	89.38	88.58
T10	73.52	70.21	64.93	68.84	69.26	69.35
Mean	82.60	84.05	76.75	82.24	83.19	

	Varieties	Treatments	Interaction
F-test	*	*	*
S.Em±	0.263	0.372	0.831
C.D. at 5%	0.729	1.031	2.305

Result and Discussion

The data pertaining to the percentage of rooting is presented in the table. Which revealed the significant difference between among the treatments and varieties Maximum percentage of rooting was recorded in treatment *Trichoderma harzianum*+ *Glomus mosseae* + PSB each @ 2.5g/kg of potting mixture+1000 ppm IBA (T8) (92.86%) and it was followed by treatment *Trichoderma harzianum*+ *Glomus mosseae*+ PSB each @ 5.0g/kg of potting mixture (T7) (90.86%) and treatment control @1000 ppm IBA (T9) (88.58%). However lowest rooting percentage was noticed in the treatment absolute control (T10) (69.35%). Among the varieties maximum rooting percentage was recorded in Bangalore Blue (84.05%), followed by Arka Kanchan (83.19%) and Arka Soma (82.60%). However least rooting percentage was noticed in Queen of Vine Yard (76.75%).

Interaction effect between the treatments and varieties were also found to be significant. The variety Arka Thrishna with treatment *Trichoderma harzianum*+ *Glomus mossae* + PSB each @2.5g/kg of potting mixture+1000 ppm IBA (T8) recorded maximum percentage of rooting (95.31%). Which, was onpar with treatment *Trichoderma harzianum*+ *Glomus mossae* + PSB each @5.0g/kg of potting mixture (T7) (94.28%) and followed by Arka Kanchan with treatment *Trichoderma harzianum*+ *Glomus mossae* + PSB each @2.5g/kg of potting mixture+1000 ppm IBA (T8)(94.89%). Whereas the least percent of rooting was noticed in variety Queen of Vine Yard with treatment absolute control (T10) (64.93%). in the present investigation the cuttings that were treated with the combination of three microorganism along with IBA recorded the highest rooting of cuttings, this may be due to the production of rooting co factors, production of growth regulators, vitamins and biotins which helped for the rooting of cuttings. Similar views have been reported by Bose and Mandel (1972) [4], Nageswar *et al*. (1999) [8], Damar *et al.* (2014) [5], Ahmad (2016) [6] and Abhinav (2009) [7].

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