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Bio-enhancer: A potential input for flowering and post-harvest life of rose (*Rosa hybrida*) cv. Grand Gala

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ABSTRACT

The present investigation was carried out to find the response of different bio-enhancers, i.e. *Panchgavya, Jivamrita* and vermiwash on flowering and post-harvest attributes of rose (*Rose hybrida*) cv. Grand Gala. There were three levels of each treatment used . *Panchgavya* at 0%, 3% and 6% and *Jivamrita* 0%, 20% and 30% were drenched while vermiwash was sprayed on the plants at 0, 1:5 and 1:10 time dilution. Observations were recorded on flowering and post-harvest attributes in winter season of 2011-12 and 2012-13. Results revealed that 6% *Panchgavya* + 1:5 times dilution of vermiwash + 30% *Jivamrita* was found most superior than other treatments and resulted in earliest bud initiation , maximum number of flowers/plant, maximum flower bud length, maximum number of petals/flower, larger flower diameter,duration of flowering flower stem length,and flower yield. Post-harvest attributes, viz. initial diameter of bud at harvesting stage, final diameter of flower in vase, initial weight of bud at harvesting stage, final weight of flower in vase and vase life were found superior with the application of 6%,*Panchgavya* + 1:5 times dilution of vermiwash + 30% *Jivamrita*.

Key words: Bio-enhancer, Flowering, *Panchgavya*, Post-harvest, Rose

Organic production of flower crops has many benefits to the soil, human, society and environment welfare. Organically grown flowers meet stringent standards that have better return potential. An ancient literature "*Vrikshayurveda*" (Science of plant life) authored by Surapala is a treasure trove of information on agriculture and as such could lend support to organic agriculture. Number of organic farmers devised organic boosters as their own techniques based on local experiences and given specific names such as *Amritpani, Panchgavya, Bijamrita, Jivamrita*, etc. 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).

Panchgavya is a special bio-enhancer prepared from five products obtained from cow products, i.e. dung, urine, milk, curd and ghee. These are properly mixed and incubated for recommended period to get ready fermented solution which has miraculous effect on crops. Preparation is rich in nutrients, auxins, gibberellins and microbial fauna and acts as tonic to enrich soil induce plant vigour with quality production. Cow urine is antibacterial, antifungal, antiviral, non toxic, very potent immune enhancer consisting water (95%), urea (2.5%), minerals (2.5%), hormones, enzymes, amino acids, cytokines, etc. Cow dung has antiseptic, anti radioactive and antithermal properties and containing menthol, ammonia indol, salammoniac, phenol and formalin (Pathak and Ram 2013). 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 microbial activity in the soil. 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). Vermiwash microflora contains *Azotobacter, Agrobacterium* and *Rhizobium* and phosphate solubilizing microbes. Presence of these microbes makes available inorganic N, amino acids and inorganic

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phosphate to plants through ammonification and nitrification process. Keeping in view the urgency of new age farming system and environment in mind, the present investigation was carried out to study the effect of various bio-enhancers namely *Panchgavya, Jivamrita* and vermiwash on flowering and post-harvest life of rose (*Rosa hybrida*) for commercial cultivation.

MATERIALS AND METHODS

The present investigation was conducted during 2011-12 and 2012-13 at Model Floriculture Centre, G B Pant University of Agriculture and Technology, Pantnagar, Uttarakhand. The experimental material used for the study was a Hybrid Tea rose cv. Grand Gala budded on rootstock *Rosa indica* var. *odorata*. Budded plants were planted at a spacing of 30 cm x 20 cm in 1 m^2 plot under protected conditions in a polyhouse. All the plants were maintained under uniform cultural practices like irrigation, weeding, pinching, disbudding, etc. except treatments during the course of study. *Panchgavya* at 0% (P_0), 3% (P_1) and 6% (P_2) and *Jivamrita* at0% (J_0), 20% (J_1) and 30% (J_2) were used as soil drench while, vermiwash was sprayed on the plants at 0 (V_0), 1:5 (V_1) and 1:10 (V_2) times dilution with a total of 27 treatment combinations and recommended dose of fertilizers (50:40:30 g N:P:K/m^2) as control. Observations were recorded on various flowering traits like days taken to first bud initiation, number of flowers per plant, flower bud length, number of petals per flower, flower diameter, duration of flowering, flower stem length and flower yield per square meter and under post-harvest life parameters like initial diameter of bud at harvesting stage, Final diameter of flower in vase, initial weight of bud at harvesting stage, final weight of flower in vase and vase life were observed. For preparing 20 litres of *Panchgavya,* 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 litres), cow's milk (2 litres), cow's curd (2 litres), sugarcane juice (3 litres), tender coconut water (2 litres) 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 *Panchgavya* 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 litres of water in a mud pot followed by addition of 4 litres 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 litres (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 dropwise 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 rose plants in different concentrations. Observations were recorded on flowering and post-harvest life of rose plants. Investigation was analyzed statistically 3^3 Factorial with Control in Randomized Block Design (RBD) with three replications.

RESULTS AND DISCUSSION

Data pertaining to interaction among *Panchgavya*, vermiwash and *Jivamrita* and their effect on various flowering and post-harvest attributes of rose are presented in Table 1 and 2. Significant differences were recorded among various bio-enhancers for various characters studied in the year 2011-12 and 2012-13. Interaction of the treatments viz. *Panchgavya*, vermiwash and *Jivamrita* significantly affected the days taken to first bud initiation (Table-1). Treatment 0% of *Panchgavya* with 0% of vermiwash and 0% *Jivamrita* resulted in 65.9 days in the first year and 68.1 days in the second year for the first flower bud to initiate. The earliest bud initiated was observed in 52.8 and 53.2 days in the years 2011-12 and 2012-13, respectively, in the treatment T_{24} ($P_2V_1J_2$). The same treatment ($P_2V_1J_2$) displayed maximum number of flowers per plant, i.e. 3.1 and 4.5 in both the successive years with 6% *Panchgavya*, 1:5 times of dilution of vermiwash and 30% *Jivamrita*. Besides, the previous characters the treatment T_{23}($P_2V_1J_1$) exhibited significantly longer flower buds i.e, 4.6 and 4.9 cm in both the respective years. Slightly higher values for bud length were observed in T_{24}($P_2V_1J_2$) proving itself largest among the lot, i.e 4.8 and 4.9 cm in both the years. These treatments (T_{23} and T_{24}) also superseded the bud length at RDF (4.5 and 4.7) with a high difference quotient.Treatment T_{24} displayed 30.7 and 35.5 petals/flower for both the years, respectively, which was highest value of character under study. Out of 27 treatments, 15 combinations displayed higher values of petals/plants than the RDF. The observations revealed that petal occurrence is highly responsible to *Panchgavya* and vermiwash and least responsive to *Jivamrita*. The results also revealed that fluctuation of *Panchgavya* and vermiwash may create a spectrum for petal number in plants. *Panchgavya* showed significant influence on petal number. Out of 27 combinations, 11 displayed values higher than the RDF (7.8 and 8.0) for flower diameter. Significantly higher values were observed in the treatments, viz T_{26}(8.7 and 9.0 cm), T_{23}(8.5 and 9.1) with the largest diameter in T_{24}(9.0cm and 9.3cm) in both years, respectively, revealing the fact towards the responsiveness of panchgavya for diameter. Six combination of treatments flowered for longer duration as components to RDF (23.3 and 25.3 days). A clear cut

Table 1 Effect of bio-enhancers on floral attributes

Treatment	Days taken to first bud initiation		Number of flowers/plant		Flower bud length (cm)		Number of petals/flower		Flower diameter (cm)		Duration of flowering (days)		Flower stem length (cm)		Flower yield/ square meter	
	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13
T_1 $P_0V_0J_0$	65.9	68.1	0.3	1.8	3.0	3.1	20.0	22.2	5.9	5.9	17.0	18.1	63.0	65.3	3.0	11.3
T_2 $P_0V_0J_1$	64.9	66.1	0.6	2.4	3.1	3.2	20.6	23.2	6.9	7.1	19.9	20.5	64.9	65.4	6.3	12.5
T_3 $P_0V_0J_2$	64.8	65.1	0.7	2.1	3.2	3.3	21.9	23.5	7.1	7.2	20.7	21.3	67.1	68.2	5.3	15.2
T_4 $P_0V_1J_0$	62.8	63.2	0.7	2.2	3.4	3.3	22.7	24.2	7.4	7.5	21.8	22.5	70.5	72.0	6.7	12.5
T_5 $P_0V_1J_1$	62.3	63.9	0.7	2.3	3.5	3.6	22.9	24.9	7.5	7.6	21.1	22.4	70.5	72.2	7.0	13.1
T_6 $P_0V_1J_2$	61.4	63.5	0.8	2.2	3.5	3.6	23.6	25.5	7.5	7.6	21.5	22.9	71.3	73.2	7.0	13.4
T_7 $P_0V_2J_0$	62.1	63.2	0.5	2.0	3.3	3.3	20.4	23.3	7.3	7.4	21.7	23.5	70.2	71.4	6.7	12.4
T_8 $P_0V_2J_1$	62.8	65.8	0.6	2.4	3.5	3.5	21.0	24.6	7.4	7.5	21.2	22.2	69.5	71.6	6.0	13.0
T_9 $P_0V_2J_2$	64.3	65.5	0.6	2.4	3.9	3.9	21.7	24.6	7.4	7.5	20.85	22.5	70.1	72.6	6.3	13.3
T_{10} $P_1V_0J_0$	59.3	61.2	0.6	2.4	4.0	4.2	23.2	25.3	7.5	7.6	21.6	23.2	74.0	76.2	7.0	13.5
T_{11} $P_1V_0J_1$	59.5	60.3	0.7	2.5	4.2	4.2	23.5	26.1	7.6	7.7	21.3	23.5	76.6	77.5	7.3	13.7
T_{12} $P_1V_0J_2$	57.9	58.2	0.7	2.5	4.1	4.3	23.7	26.2	7.6	7.7	22.2	23.6	76.4	77.7	6.3	13.8
T_{13} $P_1V_1J_0$	57.1	57.6	1.3	2.7	4.4	4.3	25.7	30.3	7.8	7.9	23.3	24.2	81.9	83.5	7.3	14.2
T_{14} $P_1V_1J_1$	56.9	57.1	1.3	2.9	4.3	4.3	25.1	28.6	7.9	8.1	23.4	24.5	84.6	86.2	8.0	14.3
T_{15} $P_1V_1J_2$	55.8	55.9	1.4	2.9	4.6	4.6	29.3	32.2	8.2	8.3	23.4	24.9	84.9	86.7	7.7	14.4
T_{16} $P_1V_2J_0$	57.7	57.5	0.8	2.8	4.2	4.5	27.7	30.1	7.7	8.0	22.1	24.5	78.8	79.6	7.7	14.2
T_{17} $P_1V_2J_1$	57.5	58.5	0.9	3.1	4.2	4.5	26.4	28.5	7.8	8.0	22.2	24.5	82.3	85.3	7.0	14.1
T_{18} $P_1V_2J_2$	56.5	56.3	0.9	3.5	4.4	4.7	27.1	32.1	8.1	8.2	21.2	24.9	86.5	87.6	8.3	14.3
T_{19} $P_2V_0J_0$	56.4	57.2	1.5	3.1	4.5	4.6	26.3	30.3	7.9	8.2	22.3	23.3	87.3	88.6	8.0	14.9
T_{20} $P_2V_0J_1$	55.5	55.5	1.6	3.2	4.5	4.7	26.7	31.1	8.1	8.3	22.5	25.1	91.0	91.6	7.7	14.9
T_{21} $P_2V_0J_2$	54.7	55.5	1.7	3.3	4.3	4.5	27.7	31.6	8.1	8.3	22.6	25.7	91.1	92.5	8.3	15.0
T_{22} $P_2V_1J_0$	54.4	55.2	2.2	3.5	4.5	4.7	27.7	32.1	8.4	8.6	23.8	26.4	98.3	95.5	7.7	15.2
T_{23} $P_2V_1J_1$	54.0	54.6	2.4	3.8	4.6	4.9	28.2	32.2	8.5	9.1	24.0	28.5	99.9	102.2	8.3	15.4
T_{24} $P_2V_1J_2$	52.8	53.2	3.1	4.5	4.8	4.9	30.7	35.5	9.0	9.3	25.4	28.9	109.8	112.3	9.3	16.5
T_{25} $P_2V_2J_0$	54.9	54.6	2.2	3.6	4.6	4.8	28.0	32.3	8.2	8.5	22.9	26.5	102.5	106.2	9.0	15.4
T_{26} $P_2V_2J_1$	54.5	54.2	2.3	3.8	4.3	4.8	28.6	32.6	8.4	8.9	23.1	26.5	104.0	109.9	8.7	15.9
T_{27} $P_2V_2J_2$	53.2	54.2	2.4	4.1	4.6	4.8	29.8	33.3	8.7	9.0	24.2	27.2	108.7	110.2	8.7	16.2
RDF	60.1	62.4	0.8	3.2	4.5	4.7	24.7	26.2	7.8	8.0	23.3	25.3	74.1	75.3	7.7	16.3
SEm±	1.82	1.6	0.21	0.1	0.32	0.1	2.41	0.9	0.21	0.1	1.03	0.8	2.21	1.9	0.68	0.5
CD(P=0.05)	5.11	4.5	0.60	0.3	0.89	0.3	6.76	2.5	0.59	0. 39	2.88	2.2	6.18	5.3	1.91	1.4

difference was observed in the duration of flowering in both the years for same treatment. Each treatment flowered for longer duration in the year 2012-13 with respect to the previous year. The similar trend in the differences may be due to micro and macro climatic conditions prevailing before flowering. With a marginal difference, T_{27} (P_2 V $_2$J $_2$) displayed a significant duration for flowering as compared to RDF, i.e 24.2 and 27.2 days, respectively. Rose flowers with longest stem length (109.8 cm and 112.3cm) were obtained in T_{24} ($P_2V_1J_2$) which was *at par* with T_{27} ($P_2V_2J_2$) in both the years. Treatment RDF was recorded with 75.3cm long length of flower stem. The maximum yield of flower (16.5/m^2) was observed in the treatment 6% *Panchgavya*, 1:5 times dilution of vermiwash and 30% *Jivamrita* T_{24} ($P_2V_1J_2$) which is *at par* with RDF (16.3/m^2) and minimum yield (11.3/m^2) was reported in T_1 ($P_0V_0J_0$). Commencement of flower buds earlier indicates that combined application of the bio-enhancers helps in more accumulation of C:N ratio and synthesis of more gibberellin in the plant system which might have helped in advancement of flowering. According to Beaulah 2001 *Panchgavya* application advanced the commencement of first flowering in *Moringa oleifera.* Rajmani *et al.* (2005) and Selvi *et al.*(2002) reported the application of *Panchgavya* in kalmegh, *Rosa bourboniana* and *R. centifolia*. Increase in the floral attributes such as number of flowers per plants, flower bud length, number of petals per plant, flower diameter, flower stem length and flower yield may be due to the increased ability towards absorption of immobile nutrients like N, P, Zn, Fe, Mg, Mn, and Cl alongwith the presence of auxins in *Panchgavya* regulates flower initiation and development. The combine effect of *Panchgavya*, vermiwash and *Jivamrita* increases the availability and absorption beside release of growth promoting hormones like IAA and GA which promotes growth by enhanced cell division and enlargement that ultimately favours increase in floral traits. This observation was in conformity with the findings of Singh *et al.* (2007) in gladiolus, Sharma *et al.* (2010) in carnation, Saraf and Nagar (2003) and Dharma (2006) in carnation. The increase in duration of flowering due to application of bio-enhancers may be because of continuous synthesis of florigen and more accumulation of photosynthates in plant system which in turn helps in increasing duration of flowering. The present findings were in accordance with

Table 2 Effect of bio-enhancers on post-harvest attributes

Treatment	Initial Diameter of bud at harvesting stage		Final diameter of flower in vase		Initial weight of but at harvesting stage		Final weight of flower in vase		Vase life	
	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13	2011-12	2012-13
T_1 $P_0V_0J_0$	3.0	3.2	5.93	6.1	13.9	14.1	11.6	13.5	6.3	6.5
T_2 $P_0V_0J_1$	3.3	3.4	6.47	6.5	15.8	16.2	14.7	15.1	7.6	7.8
T_3 $P_0V_0J_2$	3.9	4.1	6.40	6.6	16.8	17.4	13.9	15.8	7.6	7.5
T_4 $P_0V_1J_0$	4.2	4.2	7.10	7.3	18.2	17.1	17.0	15.2	7.6	7.8
T_5 $P_0V_1J_1$	4.4	4.5	7.47	7.5	18.6	18.6	17.4	17.5	7.9	8.1
T_6 $P_0V_1J_2$	4.8	5.1	7.87	7.9	19.3	19.5	17.6	17.8	7.8	8.2
T_7 $P_0V_2J_0$	4.0	4.2	6.77	6.9	17.2	18.2	16.4	17.1	7.3	7.2
T_8 $P_0V_2J_1$	4.2	4.3	7.13	7.2	17.5	18.3	17.2	17.4	7.4	7.5
T_9 $P_0V_2J_2$	4.5	4.5	7.20	7.3	18.3	18.5	17.5	17.2	7.8	7.8
T_{10} $P_1V_0J_0$	4.7	4.7	7.30	7.4	20.1	20.1	18.4	19.1	8.0	8.2
T_{11} $P_1V_0J_1$	4.8	4.8	7.37	7.4	20.2	20.3	19.0	19.1	8.1	8.3
T_{12} $P_1V_0J_2$	4.8	5.1	7.53	7.6	21.2	22.1	20.2	20.8	8.2	8.7
T_{13} $P_1V_1J_0$	4.9	5.2	7.60	7.8	22.1	22.5	20.8	21.1	8.8	8.5
T_{14} $P_1V_1J_1$	4.7	5.1	7.70	7.9	17.1	19.2	21.2	18.0	9.3	9.2
T_{15} $P_1V_1J_2$	5.2	5.6	7.70	8.1	24.6	25.5	23.2	24.5	9.4	9.3
T_{16} $P_1V_2J_0$	4.7	5.1	7.67	7.8	20.9	22.2	19.4	21.1	8.8	9.0
T_{17} $P_1V_2J_1$	4.7	4.8	7.73	8.0	21.1	22.3	20.5	21.2	8.9	8.6
T_{18} $P_1V_2J_2$	4.9	4.9	7.77	7.9	21.6	22.5	20.8	21.3	9.2	8.8
T_{19} $P_2V_0J_0$	4.6	4.9	7.80	7.8	22.1	22.8	21.0	20.8	9.4	8.8
T_{20} $P_2V_0J_1$	4.8	4.9	7.83	8.0	23.1	24.2	23.1	23.1	9.4	9.0
T_{21} $P_2V_0J_2$	4.8	5.0	7.97	7.7	23.7	24.8	22.6	23.6	9.5	8.9
T_{22} $P_2V_1J_0$	5.1	5.3	8.17	8.3	24.2	25.6	23.3	24.1	11.3	10.2
T_{23} $P_2V_1J_1$	5.4	5.5	8.30	8.4	24.5	25.6	23.6	24.2	11.4	11.5
T_{24} $P_2V_1J_2$	5.7	5.8	8.43	8.5	25.2	26.8	24.6	25.5	12.3	12.5
T_{25} $P_2V_2J_0$	4.8	5.2	7.93	8.3	23.8	24.5	23.4	23.1	11.2	11.2
T_{26} $P_2V_2J_1$	4.6	5.4	8.07	8.4	24.2	24.8	23.5	23.1	11.5	11.2
T_{27} $P_2V_2J_2$	4.8	5.6	8.20	8.5	24.2	25.1	23.7	24.0	11.9	11.5
RDF	3.7	4.1	7.87	7.9	21.3	23.2	20.9	22.1	9.4	10.0
S.Em±	0.43	0.09	0.34	0.18	1.86	0.81	1.86	1.00	0.61	0.15
CD(P=0.05)	1.20	0.26	0.96	0.51	5.20	2.28	5.21	2.81	1.72	0.43

result of Rajmani *et al*. (2005) and Selvi *et al*. (2002) who reported that the application of *Panchgavya* in kalmegh and *Rosa bourboniana* and *R. Centifolia*. Mahawer *et al.* (2010) reported similar results in tuberose.

The perusal of data presented in the Table 2 indicates that among various post-harvest traits; Out of 27 treatments only two treatments T_1 and T_2 displayed shorter initial diameter of bud than RDF. Entailing the responsiveness of character toward the bio-enhancer (*Panchgavya* and vermiwash) maximum diameter was recorded to be 5.7 cm and 5.8 cm, respectively, in both the seasons. As in previous characters the treatment T_{24} again proved with maximum final diameter of flowers vase i.e 8.43 and 8.5cm in both the respective years. Out of total of 27 treatments, six doses T_{21} T_{22} T_{23} T_{24} T_{25} T_{26} T_{27} were effective to produce final diameter of flower in vase as compared to RDF. Maximum value for the initial weight of flower bud (25.2 and 26.8g) was recorded in the plants treated with 6% *Panchgavya,* 1:5 times dilution of vermiwash and 30% *Jivamrita* T_{24} ($P_2V_1J_2$). The smallest value for the weight of flower bud (14.1g) was measured in T_1 that is 0% *Panchgavya,* 0% of vermiwash and 0% *Jivamrita* ($P_0V_0J_0$). Recommended dose of fertilizers produced buds recorded 23.2g weight. The heaviest flower in vase (25.5g) was obtained in T_{24} ($P_2V_1J_2$) that is 6% *Panchgavya* with 1:5 times dilution of vermiwash and 30% *Jivamrita* which was found significant to RDF (22.1g).The lightest flower in vase (13.5g) was observed in T_1 ($P_0V_0J_0$). Application of 6% *Panchgavya,* 1:5 times dilution of vermiwash and 30% *Jivamrita* ($P_2V_1J_2$) recorded maximum vase life of 12.5 days. Treatments T_{27} $P_2V_2J_2$ (11.5 days), T_{26} $P_2V_2J_1$ (11.2 days), T_{25} $P_2V_2J_0$ (11.2 days) and T_{23} $P_2V_1J_1$ (11.5 days) were found statistically *at par* to each other. The improvement in the post-harvest attributes like initial diameter of bud at harvesting stage, final diameter of flower in vase, initial weight of bud at harvesting stage, final weight of flower in vase and vase life may be due to the presence of microorganisms in *Panchgavya*, vermiwash and *Jivamrita* helps in efficient root proliferation, better nutrient absorption and water uptake. Higher number of leaves might have resulted in higher photosynthetic activities and more carbohydrates accumulation. the disorder free longer vase life may be attributed to the presence of nutrient elements like N, P, K, Ca, Mg, Cu, Fe, Na and Mn present in *Panchgavya* (Dharma 2006). These results are in close conformity with the findings of Chandrashekhar and Gopinath (2004) in carnation.

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