

## Effect of Fortified Lac Mud Application on Growth and Flower Production of Rose

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**ABSTRACT:** An experiment was conducted at the research farm of ICAR- Indian Institute of Natural Resins and Gums, Ranchi, India for two consecutive years to evaluate the suitability and effectiveness of lac mud on growth and flower production of rose. Lac mud is the waste product of lac processing industries which contained sizeable quantity of macro and micro nutrients. Experimental result revealed that application of fortified lac mud with 0.2% N + 0.2% P<sub>2</sub>O<sub>5</sub> + 0.2% K<sub>2</sub>O and 0.2% N + 0.2% K<sub>2</sub>O, being at par, gave the highest flower yield and these two treatments were superior to all other lac mud fortified or unfortified treatments including conventional method of manuring (application of vermicompost in pot mixture). Per cent increase in flower yield due to application of fortified lac mud with 0.2% N + 0.2% P<sub>2</sub>O<sub>5</sub> + 0.2% K<sub>2</sub>O and 0.2% N + 0.2% K<sub>2</sub>O over conventional method of manuring was 43.5 and 37.2 per cent, respectively. Almost similar trend for response of fortified lac mud was also noticed on number of flowers per plant, plant height, days to 1<sup>st</sup> flower bud appearance and flower diameter. Thus, fortified lac mud may be applied for rose cultivation as a substitute of other organic manure.

**Key words:** Lac mud, Rose Cultivation, Organic Manure, Fortification, Vermicompost.

### INTRODUCTION

The cultivation of rose is highly remunerative enterprise. Rose is nutrient loving plant and it needs replenishment in the soil through different sources. In the present era of energy crisis with increasing prices of chemical fertilizers coupled with concern about ecological stability, alternative strategies for long-term sustainability of soil productivity along with environmental protection are the major concerns. Chemical fertilizers have the capacity to supply only one or few plant nutrients. Organic manures supply number of macro and micro-nutrients essential for healthy growth and development of plant. For sustainability, neither chemical fertilizer nor organic manures alone but their integrated use has been observed to be highly beneficial [3, 6, 7]. Application of nutrients through organic manures and inorganic fertilizers has been found beneficial for proper growth and development of rose. Inadequate plant nutrition causes serious disorders in rose and may eventually lead to decline of plants. Current development in sustainability involves a rational exploitation of different alternative sources of plant nutrients

including industrial waste product. Lac mud is the waste product of lac processing industries which is obtained to a tune of about 2.5 to 4.5% on dry and wet weight basis, respectively, of the raw material (stick lac) processed. Analysis of lac mud revealed higher content of organic carbon (23.3%) and organic matter (40.2%). Besides it also contains 0.65% N, 0.31% P<sub>2</sub>O<sub>5</sub> and 0.12% K<sub>2</sub>O. Sulphur, copper, zinc, iron, boron and molybdenum content in lac mud was found quite higher. Lac mud produced in our country is mostly dumped due to lack of proper method of disposal which may create pollution hazards. In long run it is not suitable for sustainability of lac industry and in turn lac production system. Beneficial effect of lac mud has been reported in rice [8]. However, no other information is available for utilization of lac mud as manure. Therefore, the present experiment was undertaken to evaluate the suitability and effectiveness of lac mud on growth and flower production of rose.

### MATERIALS AND METHODS

An experiment in earthen pots was conducted at the research farm of ICAR- Indian Institute of Natural

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Resins and Gums, Ranchi, India (23°23" N latitude, 85°23" E longitude and 650 m above mean sea level) for two consecutive years during 2013-14 and 2014-15. The area experiences mild, salubrious climate, with a rather heavy rainfall pattern of about 1400 mm average, of which about 1250 mm is during the monsoon. Soil used for the experimental purpose was lateritic type, pH 4.99 and was having the contents of available organic carbon - 0.40%, nitrogen - 178 kg/ha, phosphorus -51.01kg/ha and potassium -492.8 kg/ha with EC -0.190 dSm<sup>-1</sup>. The experiment consisting of nine different fortified lac mud or vermicompost based pot mixture treatments having sand, lac mud or vermicompost and soil in 1:2:3 ratios *viz.*, lac mud fortified with 0.2% N, 0.2% P<sub>2</sub>O<sub>5</sub>, 0.2% K<sub>2</sub>O, 0.2% N + 0.2% P<sub>2</sub>O<sub>5</sub>, 0.2% N + 0.2% K<sub>2</sub>O, 0.2% P<sub>2</sub>O<sub>5</sub> + 0.2% K<sub>2</sub>O, 0.2% N + 0.2% P<sub>2</sub>O<sub>5</sub> + 0.2% K<sub>2</sub>O, lac mud without fortification and vermicompost in pot mixture (conventional) was laid out in randomized block design with three replications. Decomposed lac mud was used and it was fortified with different nutrients on per cent weight basis. The schedules of manuring have been maintained as per the treatment. Pot mixture (sand, lac mud or vermicompost and soil) @ 11 kg per pot was filled in earthen pots of 12 inch size (30 cm Top diameter x 12 cm bottom diameter x 35 cm height) during first year. Application of fortified lac mud or vermicompost was done @ 1.5 kg per pot in the pots after removing 25% old soil of pots at pruning during second year of experimentation. Budded rose plants of 6 months age was transplanted in first week of November 2013 for first year experimentation and it was pruned during second week of October 2014 for second year experimentation. All the recommended package of practices was followed for raising the experimental rose flower in each treatment.

To assess the effect of fortified lac mud, observation on plant height, stalk diameter, days to 1<sup>st</sup> flower bud appearance, flower bud length, flower diameter, number of flowers per plant and weight of flowers per plant were recorded. The data of each crop season were statistically analyzed separately. As the error variance was homogeneous, pooled analysis was done according to Cochran and Cox [1]. Since the variations among two seasons were not significant, the mean data have been presented in the paper for discussion. Various treatments were compared under randomized block design. The critical difference (CD) was computed to determine statistically significant treatment differences.  $CD = (\frac{2}{r} VEr)^{1/2} t_{5\%}$  where, VE is the error variance, r is the number of replications,

$t_{5\%}$  is the table value of t at 5% level of significance at error degree of freedom.

## RESULTS AND DISCUSSIONS

The data on growth and flower production of rose are presented in Table 1. Results revealed that differences in growth and yield characters due to different treatments were found significant, except stalk diameter and flower bud length. Application of lac mud in pot mixture fortified with 0.2% N + 0.2% P<sub>2</sub>O<sub>5</sub> + 0.2% K<sub>2</sub>O, being at par with application of lac mud fortified with 0.2% N + 0.2% K<sub>2</sub>O, 0.2% P<sub>2</sub>O<sub>5</sub> + 0.2% K<sub>2</sub>O and 0.2% N + 0.2% P<sub>2</sub>O<sub>5</sub>, resulted in significantly higher plant heights compared to all other treatments, including conventional method of manuring (application of vermicompost in pot mixture). Days to 1<sup>st</sup> flower bud appearance also differed significantly due to different treatments and earliest flower bud appearance was noticed under lac mud fortified with 0.2% N + 0.2% P<sub>2</sub>O<sub>5</sub> + 0.2% K<sub>2</sub>O, though it failed to show any significant difference over conventional method of manuring. Among the treatments maximum flower diameter was recorded with lac mud fortified with 0.2% N + 0.2% P<sub>2</sub>O<sub>5</sub> + 0.2% K<sub>2</sub>O followed by lac mud fortified with 0.2% N + 0.2% K<sub>2</sub>O. Conventional method of manuring showed almost similar flower diameter of rose to lac mud fortified with 0.2% N + 0.2% P<sub>2</sub>O<sub>5</sub> + 0.2% K<sub>2</sub>O. Plants treated with fortified lac mud with 0.2% N + 0.2% P<sub>2</sub>O<sub>5</sub> + 0.2% K<sub>2</sub>O recorded maximum number of flowers and this treatment being at par to application of lac mud fortified with 0.2% N + 0.2% K<sub>2</sub>O, yielded in significantly higher number of flowers compared to all other treatments, including conventional method of manuring. Data in table 1 revealed that the fortification of lac mud showed significant influence on flower yield. Application of fortified lac mud with 0.2% N + 0.2% P<sub>2</sub>O<sub>5</sub> + 0.2% K<sub>2</sub>O and 0.2% N + 0.2% K<sub>2</sub>O, being at par, gave the highest flower yield and these two treatments were superior to all other lac mud fortified or unfortified treatments including conventional method of manuring (application of vermicompost in pot mixture). Per cent increase in flower yield due to application of fortified lac mud with 0.2% N + 0.2% P<sub>2</sub>O<sub>5</sub> + 0.2% K<sub>2</sub>O and 0.2% N + 0.2% K<sub>2</sub>O over conventional method of manuring was 43.5 and 37.2 per cent, respectively.

Beneficial effect of lac mud on growth and yield was probably due to use of fortified lac mud could have resulted in favourable soil physical conditions, enhanced microbial activity besides supplying nutrients with increased recovery percentage.

**Table 1**  
Effect of fortified lac mud on growth and flower yield of rose (Pooled data of 2013-14 and 2014-15)

Treatment	Plant height (cm)	Stalk diameter (cm)	Days to 1 <sup>st</sup> flower bud appearance	Flower bud length (cm)	Flower diameter (cm)	Number of flowers (Per plant)	Weight of flowers (g/plant)
Lac mud fortified with 0.2% N	47.6 <sup>cd</sup>	0.42	33.4 <sup>bcd</sup>	3.16	2.42 <sup>bcd</sup>	14.1 <sup>de</sup>	205.07 <sup>de</sup>
Lac mud fortified with 0.2% P <sub>2</sub> O <sub>5</sub>	46.0 <sup>cd</sup>	0.41	34.5 <sup>de</sup>	3.10	2.32 <sup>cd</sup>	13.0 <sup>e</sup>	182.71 <sup>f</sup>
Lac mud fortified with 0.2% K <sub>2</sub> O	47.0 <sup>cd</sup>	0.42	33.8 <sup>cde</sup>	3.13	2.36 <sup>cd</sup>	13.5 <sup>de</sup>	194.61 <sup>ef</sup>
Lac mud fortified with 0.2% N + 0.2% P <sub>2</sub> O <sub>5</sub>	50.9 <sup>abc</sup>	0.43	32.4 <sup>abcd</sup>	3.24	2.55 <sup>abc</sup>	15.4 <sup>c</sup>	233.98 <sup>c</sup>
Lac mud fortified with 0.2% N + 0.2% K <sub>2</sub> O	54.2 <sup>ab</sup>	0.44	31.0 <sup>ab</sup>	3.36	2.66 <sup>a</sup>	18.3 <sup>ab</sup>	295.08 <sup>a</sup>
Lac mud fortified with 0.2% P <sub>2</sub> O <sub>5</sub> + 0.2% K <sub>2</sub> O	53.1 <sup>ab</sup>	0.44	31.3 <sup>abc</sup>	3.31	2.61 <sup>ab</sup>	17.2 <sup>b</sup>	271.67 <sup>b</sup>
Lac mud fortified with 0.2% N + 0.2% P <sub>2</sub> O <sub>5</sub> + 0.2% K <sub>2</sub> O	55.4 <sup>a</sup>	0.45	30.5 <sup>a</sup>	3.45	2.73 <sup>a</sup>	19.0 <sup>a</sup>	308.69 <sup>a</sup>
Lac mud without fortification	43.9 <sup>d</sup>	0.39	36.0 <sup>e</sup>	3.08	2.28 <sup>d</sup>	11.2 <sup>f</sup>	147.26 <sup>g</sup>
Vermicompost	49.8 <sup>c</sup>	0.43	32.8 <sup>abcd</sup>	3.19	2.50 <sup>abcd</sup>	14.5 <sup>cd</sup>	215.11 <sup>cd</sup>
S E±	2.50	0.019	1.27	0.146	0.111	0.54	9.19

Beneficial effect of lac mud on grain yield of rice has also been reported earlier [8]. Yadav [10] reported that organic manures are good source of nitrogen and are excellent for rose crop. It upon decomposition and mineralization, supplied available nutrients directly to the plants [9]. A large numbers of workers [5, 4, 2] reported synergistic interaction among organic manures and inorganic nitrogen which modified the quantum of nutrient uptake by plants as their effect is not merely added up but is actually enhanced.

From present investigation, it is concluded that lac mud with fortification of 0.2% N + 0.2% P<sub>2</sub>O<sub>5</sub> + 0.2% K<sub>2</sub>O or 0.2% N + 0.2% K<sub>2</sub>O may be used in pot mixture for planting of rose or applied at the time of pruning as an substitute of other organic manure for better flower yield of rose.

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