

1 **Growth and flower quality influenced by foliar application of Potassium Nitrate and Sujala**
2 **of Hybrid Tea rose cultivar Mohana**

3 **Abstract**

4 An experiment was conducted from September 2019 to March 2020 to examine the effect of
5 different combination of foliar applicable fertilizers on Hybrid tea rose cultivar Mohana. The
6 study was performed with 9 treatments (T₁-RDF, T₂- KNO₃ 2.5g/l, T₃- KNO₃ 5.0g/l, T₄- Soluble
7 fertilizer (Sujala) 1g/l, T₅- Soluble fertilizer (Sujala) 2 g/l, T₆- KNO₃ 1g/L+ Soluble fertilizer
8 (Sujala) 1g/l, T₇- KNO₃ 1 g/l + Soluble fertilizer (Sujala) 1.5g/l, T₈- KNO₃ 1g/L + Soluble
9 fertilizer (Sujala) 2g/l, T₉- KNO₃ 1g/l+ Soluble fertilizer (Sujala) 2.5g/l) and 3 replications.
10 From this study T₈ (KNO₃ 1g/L + Soluble fertilizer (Sujala) 2g/l) gave best in case of vegetative
11 and flower quality parameters and minimum days from FBE to cup shape and flower. While in
12 case of cup shape to full bloom minimum days was taken in T₁(RDF).

13 Key Words- Hybrid tea rose, water soluble fertilizer, foliar application, cut flower, rose

14 **Introduction**

15 Rose, universally known as the Queen of Flowers is the most beautiful and popular flower in the
16 world flower trade. The genus Rosa belong to the family Rosaceae & has species endemic to
17 North temperate region to tropical mountain. Besides occupying portion of significance as cut
18 flower in the trade. The roses also have a position in perfumery & cosmetics industries, rose hips
19 are a source of Vitamin C and used in herbal medicine. In India, roses are cultivated in
20 Maharashtra, Tamil Nadu, Karnataka and West Bengal. Among the different types of rose,
21 Hybrid Teas are dominant in the cut flower trade, preferred for its large, well framed and
22 symmetrical flower on long, strong stalks. Foliar application of nutrients is gaining importance
23 for two reasons, besides providing positive results in terms of overall growth parameters and
24 yield, it also helps in reduce the hazardous effect of soil application on soil health and ground
25 water. West Bengal occupies a place of prominence in flower cultivation. The study was taken
26 up with an objective to investigate the performance of Hybrid Tea rose cultivar Mohana in
27 response to foliar application of Potassium Nitrate and Sujala (19:19:19) and also to make a
28 foliar application nutritional dose in manner to reduce soil degradation and nutrient loss through
29 leaching.

30 **Materials and Methods**

31 **Site description**

32 The experiment was conducted at Horticulture Research Station, Mandouri, Faculty of
33 Horticulture, Bidhan Chandra Krishi Viswavidyalaya, Nadia, West Bengal. The site of
34 experiment is located at 23N latitude and 89E longitude at an elevation of 9.75 meters from
35 mean sea level. The soil of the proposed investigation site is sandy loam in texture, well drained
36 with pH level of 6.7, organic matter is 0.74%, total nitrogen 0.07%, Phosphorus 28.50 kg/hectare
37 and K₂O 78 kg/hectare.

38 **Experimental Details: -**

39 **Tested material**

40 Sujala (19:19:19) is a foliar grade complete fertilizer containing 3 forms of nitrogen, Amide
41 Nitrogen (NH₂, N-10.5%), Nitrate Nitrogen (NO₃, N- 4.0%) and Ammonium Nitrogen (NH₄, N-
42 4.5%) including water soluble Phosphorus and Potassium each containing 19 percent. Potassium
43 Nitrate (32:0:45) is also a water soluble fertilizer containing 32% of Nitrate Nitrogen and 45%
44 K₂O.

45 The cultivar selected for the study was Mohana, belong to Hybrid Tea rose, with RHS 6A,
46 developed by Hans Jurgen Evers, the flower had a light blush on the petal edges. The experiment
47 was taken up in two years old plants, planted in September 2017. The budded plants were
48 purchased from Pusphanjali Rose Nursery, Jakpur, West Bengal.

49 **Chart 1: Treatment details**

Treatments	Details
T ₁	RDF (Recommended dose of fertilizer)
T ₂	KNO ₃ 2.5g/l
T ₃	KNO ₃ 5.0g/l
T ₄	Soluble fertilizer 1g/l (Sujala)
T ₅	Soluble fertilizer 2 g/l (Sujala)
T ₆	KNO ₃ 1g/L+ Soluble fertilizer 1g/l
T ₇	KNO ₃ 1 g/l + Soluble fertilizer 1.5g/l
T ₈	KNO ₃ 1g/L +Soluble fertilizer 2g/l
T ₉	KNO ₃ 1g/l+ Soluble fertilizer 2.5g/l

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51 Recommended dose of fertilizer for rose is 75:150:50 (N:P:K) g/plant/year (TNAU Agritech
52 Portal)

53 **Experimental design and crop management**

54 Experiment was arranged in a randomized block design with 9 treatments and 3 replications. The
55 plants were planted in raised bed (1.5X1.0 m²) at a spacing of 50X30 cm 10 plants per bed. The
56 crop was raised as per the recommended cultural practices. Each bed received cow dung manure
57 @ 4 kg/m².

58 **Result**

59 **Vegetative parameters**

60 The traits plant height, plant spread, number of branches per plant and individual leaf area were
61 significant by the application of Recommended dose of fertilizer, Potassium Nitrate and Sujala.
62 Among the treatments T₉ (KNO₃ 1g/L +Soluble fertilizer (Sujala) 2.5g/l) proved it superior for
63 all the traits. Among the treatments T₁ and T₉ was statistically significant for the traits plant
64 height and number of branches per plant, but failed to show levels of significance for the traits
65 plant spread and individual leaf area.

66 **Flowering parameters**

67 The treatments positively influence the flowering parameters (days to flower bud emergence
68 from last spray, days to cup shape and days to full bloom). Early flower bud appearance was
69 recorded in the plants receiving the treatment T₈ & T₉ (KNO₃ 1g/L +Soluble fertilizer (Sujala)
70 2g/l & KNO₃ 1g/L +Soluble fertilizer (Sujala) 2.5g/l), 35.07 and 35.60 respectively.

71 Application of Sujala (19:19:19) singly at 2 g/l, 4 g/l or in combination with Potassium nitrate at
72 2 g/l & 2.5 g/l produced early flower as compare to T₁ (RDF), T₂ (KNO₃ 2.5g/l), T₃ (KNO₃ 5g/l)
73 & T₆ & T₇ (KNO₃ 1g/L+ Soluble fertilizer 1g/l & KNO₃ 1g/L+ Soluble fertilizer 1.5g/l). The
74 treatment T₁ & T₈ and T₁ & T₉ produced significant variation among the day's taken to flower
75 bud emergence. The treatments also influenced the days taken to attain cup shape stage after
76 Flower bud appearance following the same as flower bud emergence after last spray.

77 **Flower quality parameters**

78 From the table 3. It is evident that all the parameters studied to assess the bloom quality attained
79 level of significance under the influence of the treatments.

80 **Discussion**

81 Because of foliar application induce the nutrient uptake in plant and similar effect of foliar
82 application was recorded by Samia *et al.*, in Gladiolus and Ali and Mowafy (2003) studied on
83 peanut and found that potassium fertilizer significantly increased leaf area and number of
84 branches per plant. Similar effect of potassium as foliar application on flowering parameters was
85 reported by Mukesh *et al.*, (2001) in Gladiolus, Also, Butt, (2005) mentioned that K significantly
86 influenced number of days to spike emergence and first floret opening in gladiolus (Butt, 2005).
87 The improvement in the studied flowering parameters as a result of foliar potassium application
88 could be attributed to positive role of K in floret development (Zubair, 2011). The role of K in
89 the greatly improved biometric characteristics such as photosynthetic activity, N metabolism and
90 protein synthesis besides, the increase in leaf area and leaves number per plant, which in turn
91 supplied more photosynthates. (El-Tohamy *et al.*, 2011). The stimulatory effects of foliar
92 application of K might have resulted in better accumulation of assimilates thereby resulting in
93 taller, stronger and sturdier stems of cut flowers (Arvinder *et al.*, 2015). Foliar application of
94 potassium has a potential effect on the nutrient uptake and on the stimulation of growth
95 parameters and flowering characteristics (Sathyanarayana *et al.*, 2017; El-Naggar and El-
96 Nasharty 2016). Foliar fertilization increases micronutrient uptake and physiological and
97 biochemical indexes (Bistgani *et al.*, 2018; Oliveira *et al.*, 2020).

98 **Conclusion**

99 It is concluded that the performance of Hybrid Tea rose cultivar Mohana in response to foliar
100 application of Potassium Nitrate and Sujala and also made a foliar application nutritional dose in
101 manner to reduce soil degradation and nutrient loss through leaching. . From this study T8
102 (KNO₃ 1g/L + Soluble fertilizer (Sujala) 2g/l) gave best in case of vegetative and flower quality
103 parameters and minimum days from FBE to cup shape and flower.

104 Competing interests – Not applicable

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109 **References**

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143 **Table: - 1 Effect of KNO₃ & Sujala (19:19:19) on vegetative parameters of Hybrid Tea rose**
 144 **cultivar Mohana.**

Treatments	Plant height (cm)	Plant spread (cm)	No of branches/plant	Individual leaf area (cm ²)
T1	64.87	54.33	12.33	59.27
T2	45.73	44.67	9.00	42.27
T3	45.00	46.73	10.13	42.80
T4	52.00	51.40	11.07	42.73
T5	53.60	51.27	11.00	49.13
T6	58.27	52.07	12.60	49.00
T7	61.80	52.13	12.00	52.33
T8	65.27	52.00	12.20	59.13
T9	69.60	54.93	14.67	61.47
S.Em. ±	0.57	0.97	0.42	0.84
C.D. at 5 %	1.71	2.92	1.26	2.51

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151 **Table: -2 Effect of KNO₃ & Sujala (19:19:19) on flowering parameters Hybrid Tea rose**
152 **cultivar Mohana.**

Treatments	Days to FBE from last spray	Days to cup shape from FBE	Cup shape to full bloom
T1	45.93	22.07	2.27
T2	44.20	18.87	2.20
T3	41.13	19.40	2.80
T4	39.07	15.07	3.00
T5	37.00	15.20	3.00
T6	40.93	13.00	3.60
T7	41.60	14.07	3.13
T8	35.07	14.20	2.87
T9	35.60	12.00	3.00
S.Em. ±	0.48	0.14	0.16
C.D. at 5 %	1.42	0.41	0.49

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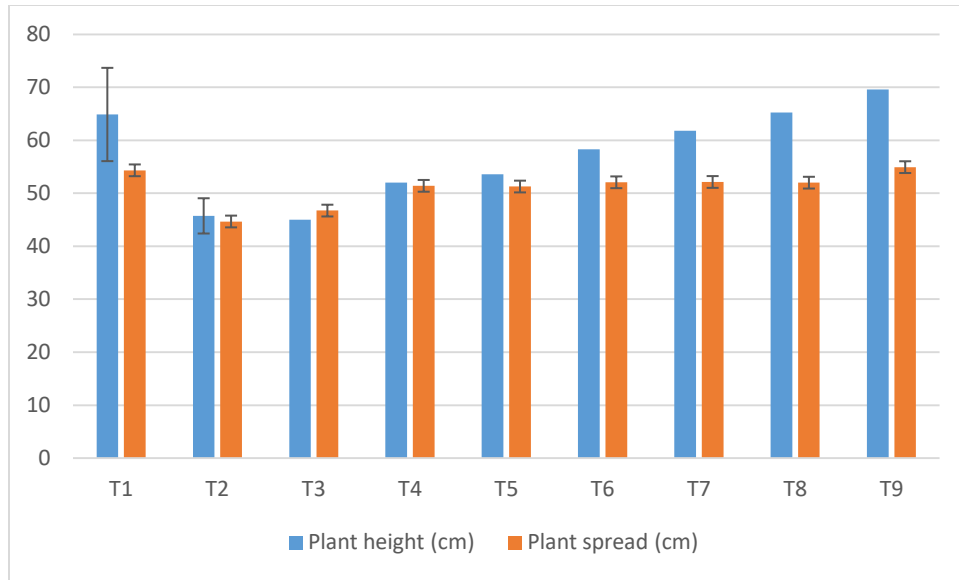
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164 **Table: - 3. Effect of KNO₃ & Sujala (19:19:19) on Flowering characteristics of Hybrid Tea**
 165 **rose cultivar Mohana.**

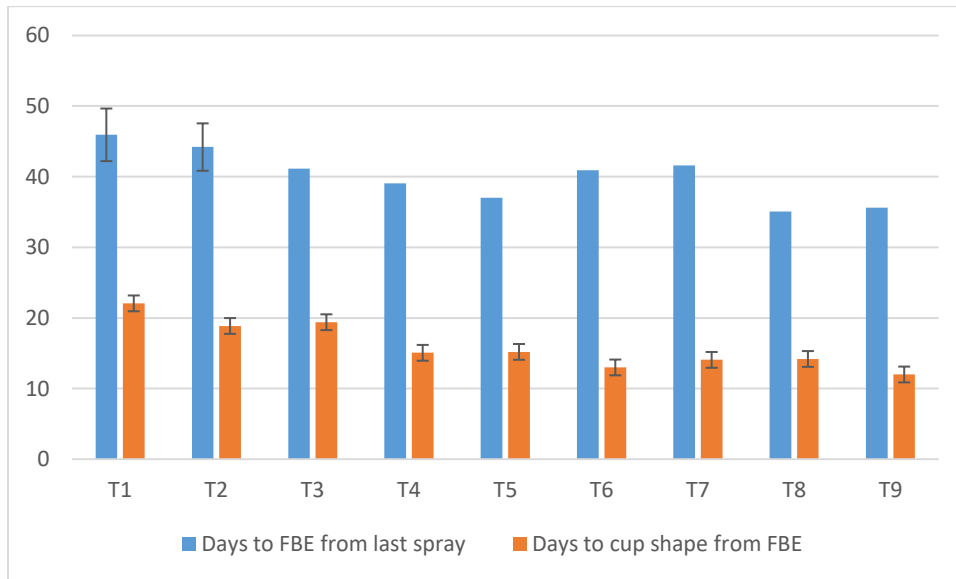
Treatment s	Flower bud diamete r (cm)	Pedice l diamete r (cm)	Flowe r shoot length (cm)	Stalk lengt h (cm)	Stalk diamete r (cm)	Pedice l length (cm)	Pedice l diamete r (cm)	Number of flowers/plan t
T1	1.57	3.47	43.47	39.07	0.65	6.07	0.69	13.80
T2	1.53	2.67	33.27	29.07	0.41	5.00	0.51	11.73
T3	1.60	2.93	37.33	32.13	0.41	5.20	0.53	12.07
T4	1.77	3.00	41.13	38.07	0.46	5.07	0.53	12.20
T5	1.80	3.73	43.20	38.07	0.50	5.27	0.54	12.13
T6	1.60	3.27	44.60	39.87	0.52	5.27	0.53	12.87
T7	1.60	3.40	44.80	39.27	0.56	3.47	0.55	13.07
T8	1.87	3.93	45.00	40.00	0.59	5.53	0.59	13.13
T9	1.90	4.00	45.93	39.73	0.62	5.87	0.61	14.13
S.Em. ±	0.06	0.19	0.21	0.30	0.01	0.30	0.01	0.19
C.D. at 5 %	0.17	0.58	0.63	0.90	0.03	0.90	0.03	0.58

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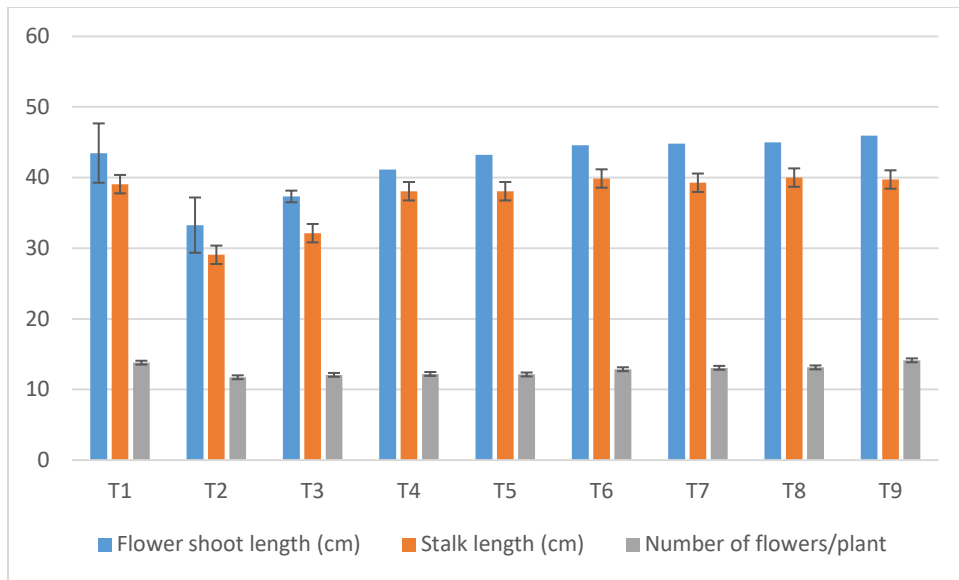
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168 **Fig: 1. Effect of KNO₃ & Sujala (19:19:19) on vegetative parameters of Hybrid Tea rose**
 169 **cultivar Mohana.**



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171 **Fig: 2. Effect of KNO₃ & Sujala (19:19:19) on flowering parameters Hybrid Tea rose**
 172 **cultivar Mohana.**



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Fig. 3. Effect of KNO₃ & Sujala (19:19:19) on Flowering characteristics and of Hybrid Tea rose cultivar Mohana.