

# Assessing the efficacy Homoeopathic medicine Gibberellic acid 3X in enhancing yield production in Neelam mango Trees: A Comparative Pilot Study

## ABSTRACT

**Aims:** Assess the influence of Gibberellic Acid 3X on yield production: Measure the effect of Gibberellic Acid 3X treatment on increasing the overall yield of Neelam mangoes, including the number of fruits, fruit weight, and fruit size, compared to the control group.

**Study Design:** A Comparative Pilot Study

Place and duration of Study: MNR Homoeopathic Medical College and Hospital premises with good sunlight and ventilation, Sangareddy, between February 2023 to August 2023

**Methodology:** The total sample size was taken as 6 Branches of 2 Trees. Three branches of a tree were divided into 3 groups. This is to ensure that the flowers of the mango tree will be receiving the same amount of water, nutrients, and sunlight. Gibberellic acid 3x was prepared according to rules and regulations of Homoeopathic Pharmacopoeia of India (HPI). Foliar application of medicine was done after the flowering of plant. The fruits are taken for analysis once they have matured.

**Results:** The "Gibberellic Acid 3X - Alcoholic potency" group had the highest mean weight (563.94 grams) and circumference (18.106 cm), followed by the "Gibberellic Acid 3X - Water potency" group with slightly lower values (556.67 grams for weight and 17.771 cm for circumference). Additionally, the "Gibberellic Acid 3X - Alcoholic potency" group had the longest mean length (18.833 cm), followed by the "Gibberellic Acid 3X - Water potency" group (17.646 cm). Overall, the "Gibberellic Acid 3X - Alcoholic potency" group displayed the highest measurements in weight, circumference, and length among the three groups.

**Conclusion:** In conclusion, this study provides evidence of the potential of homoeopathic medicine, specifically Gibberellic Acid 3X, as an effective alternative for addressing enhancing yield production in Neelam mango trees when applied via foliar spray method on flowers. It opens doors to exploring more sustainable and eco-friendly approaches to mango cultivation and warrants further investigation and application in agricultural practices.

**Keywords:** Agrohomoepathy, Gibberellic acid 3x, Neelam mango, foliar spray

## 1. INTRODUCTION

Mango (*Mangifera indica*) is one of the most economically significant fruit crops worldwide, and Neelam mangoes, a popular cultivar, are highly valued for their sweet flavor and aromatic qualities. However, fruit dropping, a phenomenon characterized by premature detachment of fruits from the tree, poses a significant challenge to mango growers as it results in reduced yield and economic losses.<sup>[5]</sup> Traditional methods of controlling fruit

dropping often involve the use of chemical plant growth regulators, which may have adverse effects on the environment and human health.

Agro-Homoeopathy is a specialized area in field of Homoeopathy which mainly deals with treatment of gardens and agricultural practices.<sup>[1]</sup> The use of Homoeopathic remedies for plants started since the pioneering works of Kolisko on wheat germination.<sup>[2]</sup> Agro-homoeopathy is the efficient way of eradicating abiotic stress in crops due to various factors. It is cost-effective and an alternative for chemical fertilizers thus helping to increase the yield and farmer's income <sup>[3]</sup>. Homoeopathy strengthens the energy and vitality of plants. Even prevents the damage caused by abiotic stress and will promote a dynamic balance within the plant and of plants with soil, water, and environment <sup>[4]</sup>.

Homoeopathy offers a potential solution to address the issue of fruit dropping in mangoes. One such homoeopathic medicine is Gibberellic Acid 3X, which is derived from the plant hormone gibberellic acid. Gibberellic Acid 3X has been reported to have beneficial effects on plant growth and development, including the regulation of flowering, fruit set, and fruit development in various crops.

However, despite the potential of homoeopathic treatments, the efficacy of Gibberellic Acid 3X in enhancing yield production in Neelam mangoes has not been extensively studied. Therefore, there is a need for a comparative study to assess the effectiveness of Gibberellic Acid 3X as a potential alternative to conventional methods.

The findings of this research can contribute to the development of sustainable and environmentally friendly strategies for mango cultivation, ensuring optimal fruit retention and increased yield production. Moreover, it can pave the way for the integration of homoeopathy into mainstream agricultural practices, providing growers with an alternative approach to managing fruit dropping in mangoes.

### **1.1 NEED OF STUDY:**

Andhra Pradesh/ Telangana is the second largest mango growing state in the country with an area of about 4.31 lakh hectares and annual production of 43.5 lakh metric tons. In Andhra Pradesh mango occupies 68 per cent of the total area under fruit. 24 % of the total production of mango in India is from Andhra Pradesh. The mango is grown extensively in Krishna, Vijayanagaram, Vishakhapatnam, West and East Godavari, Kadapa, Warangal, Nalgonda, Adilabad, Medak and Rangareddy district. <sup>[6]</sup>

Fruit drops in mangoes occur when the fruits are at peak stage of development. Moisture deficiency, nutrient deficiency, and hormonal imbalance<sup>[6]</sup> and Embryo abortion, climatic factors, disturbed water relation, lack of nutrition, attack of disease and pest, hormonal imbalances are the major factors that lead to fruit drop <sup>[7]</sup>

Gibberellins are the hormones of plant that regulates various progressions including elongation of stem, flowering, germination, senescence in fruits & leaf etc. Mango (*Mangifera indica*) is a tropical fruit having an alternate bearing habit &retorts well to the PGRs which are the growth regulators of plant. <sup>[8]</sup> The research conducted on foliar application of gibberellic acid on growth and development of mangoshowed significant improvement by Foliar application of GA3 affected the performance of the trees by amending their flowering, fruit yield & quality of mango. Experiments were conducted to check the fruit quality, change in flowering pattern, and fruit set of mango trees. Basically, GA3 at a concentration of 10-75 ppm increases the fruit set, respectively. <sup>[8]</sup>

## **2. MATERIAL AND METHODS / EXPERIMENTAL DETAILS / METHODOLOGY**

Study has taken place in MNR Homoeopathic Medical College and Hospital premises with good sunlight and ventilation. The total sample size was taken as 6 Branches of 2 Trees. Three branches of a tree were divided into 3 groups. This is to ensure that the flowers of the mango tree will be receiving the same amount of water, nutrients, and sunlight. GIBBERELIC ACID 3x was prepared according to rules and regulations of Homoeopathic Pharmacopoeia of India (HPI).

## 2.1 METHODS:

Group A: Branches which are foliar application with GIBBERELLIC ACID 3x (Alcohol potency)

Group B: Branches which are foliar application with GIBBERELLIC ACID 3x (Water potency)

Group C: Branches which are foliar application with placebo.

## 2.2PROCEDURE:

The medication was initiated after flowering of plants and was repeated once every 3 DAYS up to attainment of fruits.

## 2.3 DOSAGE:

10 drops of homoeopathic dilution in one liter of water and sprayed on flowers<sup>[9]</sup> after mixing dilution in clockwise and anti-clockwise in a rhythmic way.

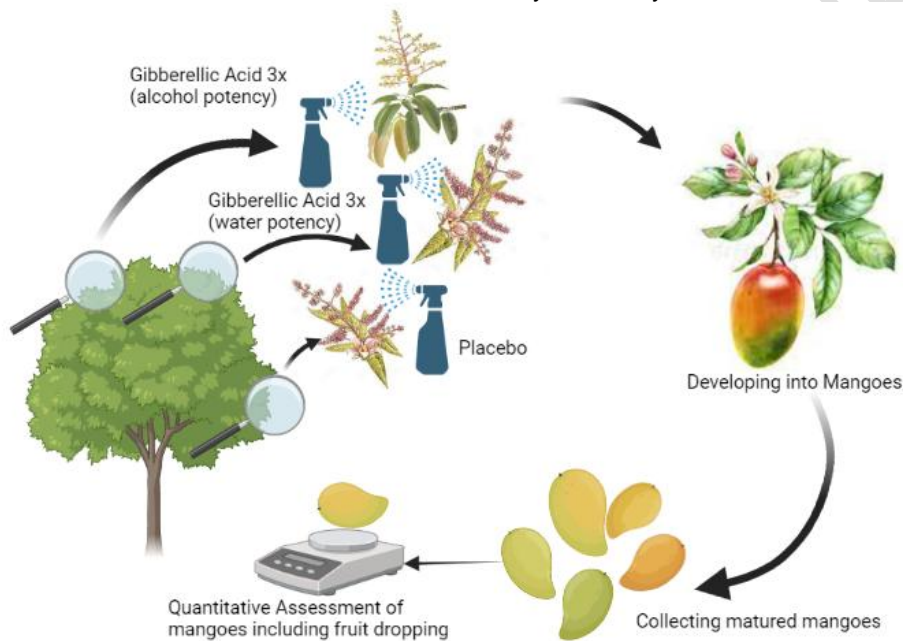


Fig 1. Methodology:



Fig 2: Foliar method of intervention on Neelam mango flowers



Fig 3,4,5: Measuring Physiological Parameters

### 3. RESULTS AND DISCUSSION

#### 3.1 PARAMETERS:

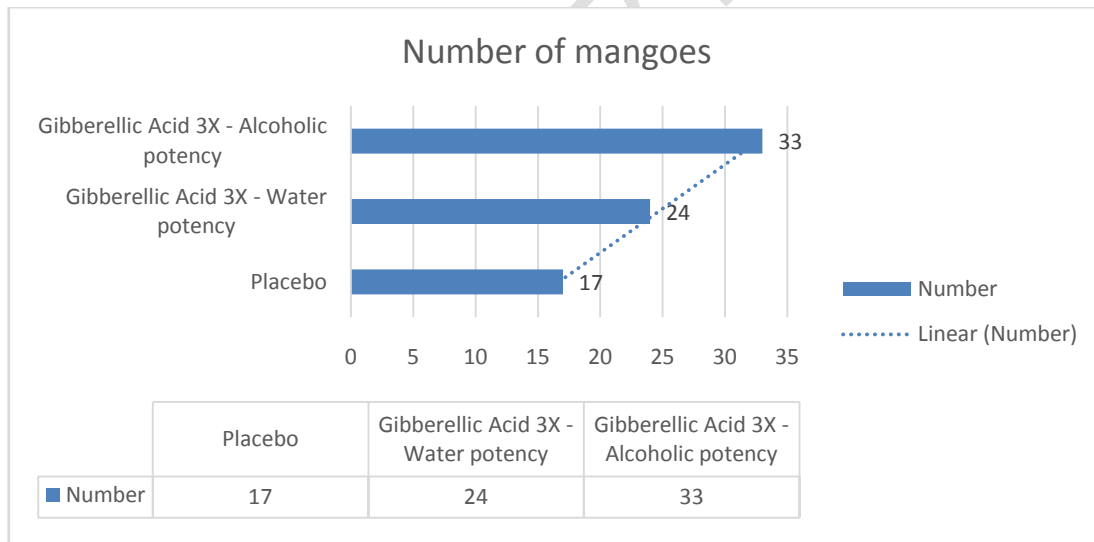


Fig 6: Number of Mangoes

#### 3.1.1 Weight:

The "Gibberellic Acid 3X - Alcoholic potency" group has the highest mean weight (563.94 grams), followed by the "Gibberellic Acid 3X - Water potency" group (556.67 grams), and then the "Placebo" group (488.24 grams).(Fig 7)

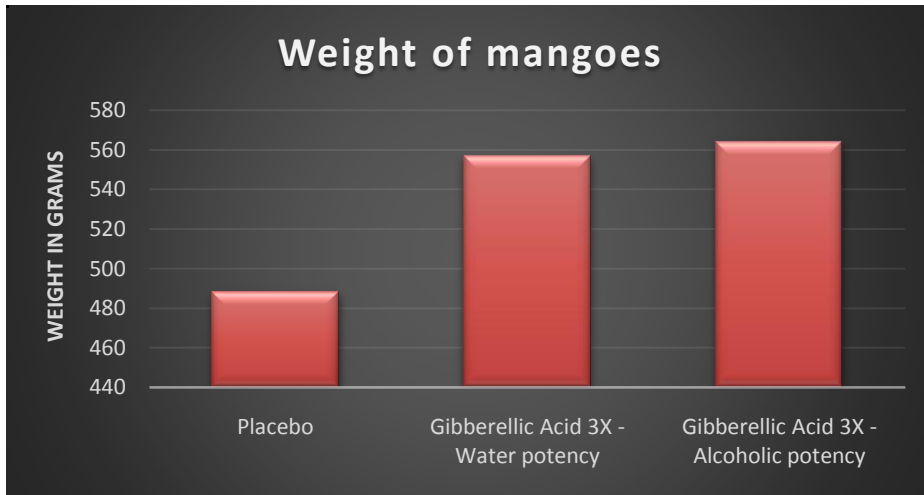


Fig 7: Weight of mangoes in Different groups

### 3.1.2 Length:

Placebo group (N=17) has a mean length of 15.559 cm with a standard deviation of 2.0224. Gibberellic Acid 3X - Water potency group (N=24) has a mean length of 17.646 cm with a standard deviation of 3.4119. Gibberellic Acid 3X - Alcoholic potency group (N=33) has a mean length of 18.833 cm with a standard deviation of 4.1187. Overall mean length for all treatments (N=74) is 17.696 cm with a standard deviation of 3.6945. (fig 8)

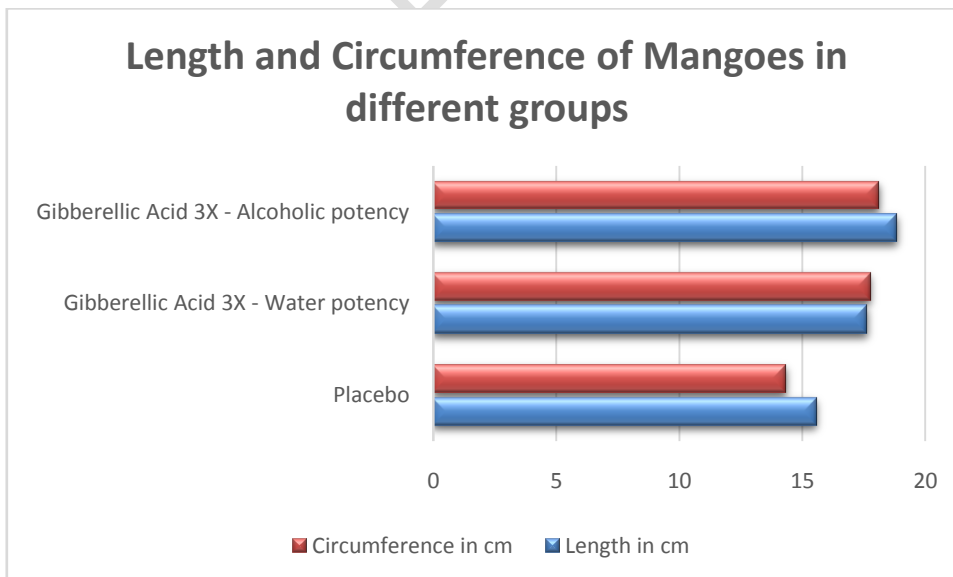


Fig 8: Length and Circumference of Mangoes in different groups

### 3.2 Statistical Analysis using SPSS.

For both Weight and Circumference of the mangoes the F-values are 3.479 and p-values are 0.036, but for the length, F-value is 4.879 and the p-values are 0.010. This indicates that there are significant differences among the treatment groups in both weight, circumference, and length. In other words, the null hypothesis, which assumes no differences between the groups, is rejected.(Table :1)

**Table: 1 ANOVA**

ANOVA						
		Sum of Squares	df	Mean Square	F	Sig.
Weight In grams	Between Groups	69833.080	2	34916.540	3.479	0.036
	Within Groups	712568.271	71	10036.173		
	Total	782401.351	73			
Circumference in cm	Between Groups	175.191	2	87.596	3.479	0.036
	Within Groups	1787.839	71	25.181		
	Total	1963.030	73			
Length in cm	Between Groups	120.395	2	60.197	4.879	0.010
	Within Groups	876.014	71	12.338		
	Total	996.409	73			

For Weight, both the comparisons of "Placebo vs. Gibberellic Acid 3X - Water potency" and "Placebo vs. Gibberellic Acid 3X - Alcoholic potency" show significant differences. This suggests that both "Gibberellic Acid 3X - Water potency" and "Gibberellic Acid 3X - Alcoholic potency" have a significant impact on weight compared to the placebo.

For Circumference, similar to weight, both the comparisons of "Placebo vs. Gibberellic Acid 3X - Water potency" and "Placebo vs. Gibberellic Acid 3X - Alcoholic potency" show significant differences. This suggests that both "Gibberellic Acid 3X - Water potency" and "Gibberellic Acid 3X - Alcoholic potency" have a significant impact on circumference compared to the placebo.

In the case of length, the Gibberellic Acid 3X - Water potency group displayed significantly greater length compared to the Placebo group ( $p = 0.049$ ). Moreover, the Gibberellic Acid 3X - Alcoholic potency group exhibited a highly significant increase in length compared to both the Placebo and Gibberellic Acid 3X - Water potency groups ( $p = 0.001$ )

These results indicate that both "Gibberellic Acid 3X - Water potency" and "Gibberellic Acid 3X - Alcoholic potency" treatments appear to be more effective than the placebo in terms of increasing weight, length and circumference. However, there is no significant difference in these outcomes between the two Gibberellic Acid treatments. (Table:2)

**Table 2: Post Hoc Tests**

<b>Post Hoc Tests</b>							
<b>Multiple Comparisons</b>							
Games-Howell							
Dependent Variable			Mean Difference (I-J)	Std. Error	Sig.	95% Confidence Interval	
						Lower Bound	Upper Bound
Weight In grams	Placebo	Gibberellic Acid 3X - Water potency	-68.431	27.843	0.048	-136.43	-0.43
		Gibberellic Acid 3X - Alcoholic potency	-75.704	28.136	0.027	-144.10	-7.31
	Gibberellic Acid 3X - Water potency	Placebo	68.431	27.843	0.048	0.43	136.43
		Gibberellic Acid 3X - Alcoholic potency	-7.273	27.231	0.961	-72.90	58.36
	Gibberellic Acid 3X - Alcoholic potency	Placebo	75.704	28.136	0.027	7.31	144.10
		Gibberellic Acid 3X - Water potency	7.273	27.231	0.961	-58.36	72.90
Circumference in cm	Placebo	Gibberellic Acid 3X - Water potency	-3.4473	1.4031	0.048	-6.870	-0.025
		Gibberellic Acid 3X - Alcoholic potency	-3.7825	1.3788	0.024	-7.133	-0.432
	Gibberellic Acid 3X - Water potency	Placebo	3.4473	1.4031	0.048	0.025	6.870
		Gibberellic Acid 3X - Alcoholic potency	-0.3352	1.3835	0.968	-3.672	3.001
	Gibberellic Acid 3X - Alcoholic potency	Placebo	3.7825	1.3788	0.024	0.432	7.133
		Gibberellic Acid 3X - Water potency	0.3352	1.3835	0.968	-3.001	3.672
Length in cm	Placebo	Gibberellic Acid 3X - Water potency	-2.0870	0.8518	0.049	-4.164	-0.010

	Gibberellic Acid 3X - Alcoholic potency	-3.2745*	0.8687	0.001	-5.376	-1.174
Gibberellic Acid 3X - Water potency	Placebo	2.0870*	0.8518	0.049	0.010	4.164
	Gibberellic Acid 3X - Alcoholic potency	-1.1875	0.9995	0.465	-3.596	1.221
Gibberellic Acid 3X - Alcoholic potency	Placebo	3.2745*	0.8687	0.001	1.174	5.376
	Gibberellic Acid 3X - Water potency	1.1875	0.9995	0.465	-1.221	3.596

\*. The mean difference is significant at the 0.05 level.

### 3.2 DISCUSSION

Homeopathy has been applied in various fields, including agriculture, as an alternative and complementary approach to conventional practices. These are a few areas where **homoeopathy** has been explored in agriculture: Pest and disease management <sup>[10,11]</sup>, Seed treatment <sup>[12,13,14]</sup>, growth and yield production <sup>[15,16]</sup>, Stress mitigation. <sup>[17, 18]</sup>

Gibberellic acid (GA) is a vital plant hormone that plays a central role in various aspects of plant growth and development. It belongs to a class of plant hormones known as gibberellins. <sup>[19]</sup> These compounds are involved in regulating many physiological processes in plants, and gibberellic acid is one of the most well-known and extensively studied gibberellins.

Gibberellic acid is a multifunctional plant hormone that regulates various aspects of plant growth and development. Its ability to promote stem elongation, seed germination, fruit development, <sup>[20,21]</sup> and more makes it a crucial tool in agriculture and horticulture for improving crop yields and plant quality.

According to experiments done by Singh, Sanjay et.al they conclude that the efficacy of plant growth regulators relies on their specific concentrations applied to fruit plants, showcasing varied effects—a single hormone can both enhance fruit quality at one concentration and postpone flowering at another, exemplified by gibberellic acid's diverse impacts. <sup>[22]</sup>

A Similar study was done at Egypt in 2016 by Amro, S.M. Salama et al <sup>[23]</sup> and in India in the year 2021 by Deen Dayal Singh, R. R. Singh and Pankaj Kumar Rayto find the efficacy of Gibberellic Acid on blooming, fruiting, and quality of mango. <sup>[24]</sup>

The findings of this study suggest that the homoeopathic medicine Gibberellic Acid 3X has a positive impact on Neelam mango trees in enhancing yield production. Both variants of Gibberellic Acid 3X (Water potency and Alcoholic potency) showed promising results in terms of increasing fruit weight and circumference, with the alcoholic potency variant exhibiting slightly better performance. These results align with previous research done using gibberellic acid in promoting fruit development and yield in mango trees. <sup>[25]</sup>

### 4. CONCLUSION

The potential benefits of using homoeopathic remedies in agriculture, as demonstrated in this study, offer a sustainable and environmentally friendly approach to mango cultivation. By reducing fruit dropping and improving yield, homoeopathic treatments like Gibberellic Acid 3X can contribute to increased income for mango growers and a more sustainable mango industry.

It is worth noting that further research with larger sample sizes and longer-term observations would be valuable to confirm and expand upon these preliminary findings. Additionally, assessing the cost-effectiveness and practicality of homeopathic treatments compared to traditional methods would be essential for their adoption in mainstream agricultural practices.

In conclusion, this study provides evidence of the potential of homeopathic medicine, specifically Gibberellic Acid 3X, as an effective alternative for addressing enhancing yield production in Neelam mango trees. It opens doors to exploring more sustainable and eco-friendly approaches to mango cultivation and warrants further investigation and application in agricultural practices.

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