



## Disease management of leaf galls of *Mitragyna parvifolia* caused by insect

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### Abstract

Like humans, plants are also continuously exposed to their environmental surroundings. These environmental stresses can be of different forms, for example, the stress produced by Pathogen attack, Chemical stress, stress due to deficient nutrients or any other. The major causative factors which lead to plant problems like galls, decay or other diseases are pathogens such as bacteria, fungi, viruses and so on. Also, environmental factors such as weather conditions and daily natural dealings can be a crucial factor along with the chemicals such as pesticides and insecticides. The management of the plant galls is quite a challenging. The important strategy *i.e.* organic in nature, to prevent the plants from galling insects is the usage of Neem Tree leaves. detergent solution.

**Keywords:** Leaf galls, *mitragyna parvifolia*, insect, environmental stress, neem tree leaves

### Introduction

The Plant tribulations which are caused by various insects that feed on the plant usually appear as necrotic regions, cankers, blights or wilts on various parts of the plant body like on leaves, a stem region, fruits or root areas. The major tribulation or plant problem which is of our concern here is the malformation and formation of galls. The management of the plant galls is quite a challenging task as preventive measures should be taken before the visual signs or symptoms of the infestation are seen. This is because of the reason as once the insect or mite is below the surface then there is no possible usage of contact chemicals like insecticides or miticides. There are several preventive techniques that are used for gall disease management such as seed treatment, usage of plant pastes or usage of soap and detergent solutions, removal and destruction of the infected or infested region, so on. Neem tree leaves can be made into a paste or powder in a 1:1 ration mixture to prepare the stock working solution with dry clay or sawdust and then can be applied and sprayed with different concentration doses, and is effective in controlling insect and mite infestation. Even 1 Kilogram of Neem powder is capable of treating about 2000 plants.

### Materials and Methods

Leaf galls of *Mitragyna parvifolia* were treated continuously with pure water, Neem extract and Detergent solutions of different concentrations for 75 days in the study area (Table 1). Experiments were conducted for 75 days in all cases *i.e.* controlled, Neem extract and Detergent.

- Controlled solution:** Only water was sprayed on leaf gall of *Mitragyna parvifolia*.
- Neem extract:** Neem extract was prepared in three different doses as 5%, 10%, 20% and sprayed on leaf galls of *Mitragyna parvifolia*.
- Detergent solution:** Different concentrations of detergent solutions were prepared by dissolving different amount of the detergent powder in water, *i.e.*, 5mg/L, 10 mg/L, 20 mg/L and sprayed on leaf gall of *Mitragyna parvifolia*.

Readings were noted after a continuous interval of 15 days *i.e.* 15 days, 30 days, 45 days, 60 days and 75 days. The effect of different sprays on the leaf galls of the *Mitragyna parvifolia* plant was recorded and results were statistically analyzed by ANOVA by using MS Excel-2019 and SPSS version-25.

### Anova Formulas

Source	Degree of freedom	SS: Sum squares	MS: Mean square	F-stat	P-value
Between the groups	K-1	SS <sub>B</sub>	MS <sub>B</sub> = SS <sub>B</sub> / K-1	F = MS <sub>B</sub> /MS <sub>W</sub>	Right tail of F (K-1, N-K)
Within the groups	N-K	SS <sub>W</sub>	MS <sub>W</sub> = SS <sub>W</sub> /N-K		
Total	N-1	Total sum square (SS <sub>T</sub> )			

Sum of squares (between groups:  $SS_B = \sum_{i=1}^k (x_i - \bar{x})^2$ , where  $n_i$  is the number of subjects in the  $i$ -th group

Sum of square within groups:  $SS_W = \sum_{i=1}^k (n_i - 1) S_i^2$ , where  $S_i$  is the standard deviation of the  $i$ -th group

### Results

The leaf gall of the plant *Mitragyna parvifolia* was treated by sprayer with control (pure water), Neem extract and

Detergent solution of different concentrations for 75 days after a regular interval of 15 days.

- Control spray:** No positive result was observed with pure water spray on leaf galls. Leaf galls increased in size and numbers on leaf treated leaves.
- Neem Extract spray:** Leaf galls continuously decreased in size as well as in numbers after the treatment of Neem extract of different concentrations in all cases (5%, 10%, 20% solutions). 20% solution of

Neem extract showed 83% positive result (Table 2). Leaf galls decreased after every 15 days. Neem extract was observed better preventive spray on leaf gall. When the result was compared with different doses of Neem extract on leaf galls, 20% Neem extract was found more effective than 5% and 10% extract in curing leaf galls of *Mitraygna parvifolia*. The result was statistically analyzed and found that P-value (5.86E-13) was less than the level of significance and the F-crit value (3.885294) was less than the F value (649.9617), so the Null hypothesis cannot be accepted (Table 4).

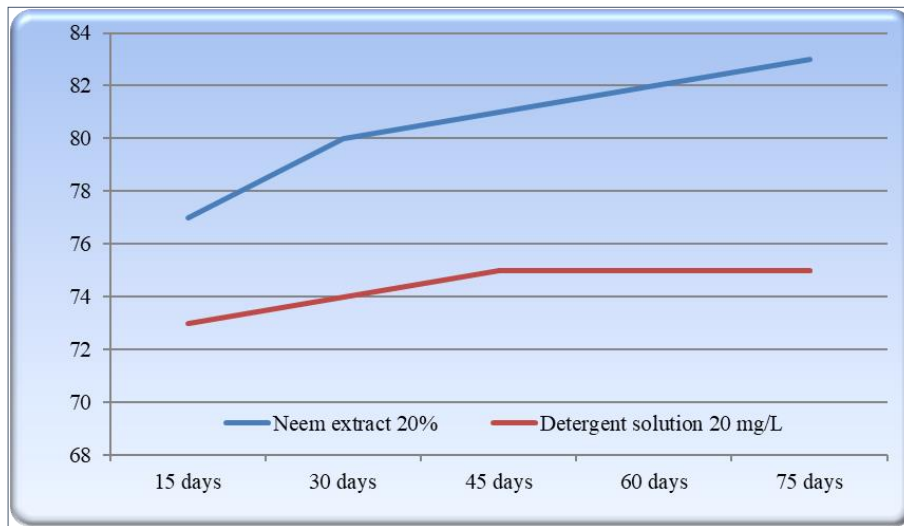
**c. Detergent spray:** Leaf galls continuously decreased in numbers as well as in size after the treatment of a detergent solution of different concentrations in all cases (5mg/L, 10mg/L, 20 mg/L solutions). 20 mg/L solution of detergent solution showed a 75% positive result (Table 3). Leaf galls decreased after every 15 days. The detergent solution was observed better preventive spray on leaf gall. When the result was compared with different doses of Detergent solution on leaf galls, 20 mg/L Detergent solution was found more effective than 5 mg/L and 10 mg/L solutions in curing leaf galls of *Mitraygna parvifolia*. The result was statistically analyzed and found that P-value (7.9E-15) was less than the level of significance ( $\alpha$  0.05) and the

F-crit value (3.885294) was less than the F value (1338.545), so the Null hypothesis cannot be accepted (Table 5).

**d. Comparing the effect of Neem extract and Detergent solution:** The result of Neem extract at 20% concentration was compared with the Detergent solution of 20 mg/L solutions after a regular interval of 15 days for 75 days. The result was statistically analyzed by ANOVA. It was found that the calculated P-value (0.000502) was less than the level of significance  $\alpha$  0.05 and the F-crit value (5.317655) was calculated less than the F-value (31.5082), so the Null hypothesis cannot be accepted and it was found that result was significant. Neem extract was observed more effective than a Detergent solution in curing leaf galls of *Mitraygna parvifolia* (Plate 1).

**Conclusion**

Neem extract was found to be more effective than the detergent solution and controlled water spray which showed the medicinal property of Neem extract. 20% Neem extract was found more effective than the solution of detergent of the concentration 20mg/L. The present study concludes the curable nature of Neem extract in the treatment of leaf gall in *Mitraygna parvifolia*.



**Fig 1:** Comparison in the effect of Neem extract and Detergent spray on leaf galls in *Mitraygna parvifolia*

**Table 1:** Leaf gall of *Mitraygna parvifolia* treated with different doses of solutions

Treatment	Control	Neem extract			Detergent solution		
Doses	Pure water spray	5%	10%	20%	5 gm/L	10 gm/L	20 gm/L
Number of Plants used	5	5	5	5	5	5	5
Days of observation	75 days	75 days	75 days	75 days	75 days	75 days	75 days

**Table 2:** The effect of different doses of Neem extract on leaf gall in *Mitraygna parvifolia*

S.N.	Days of observation after treatment	Concentration of Neem extract applied		
		5% solution	10% solution	20% solution
1	15 days	18 %	38 %	77 %
2	30 days	19 %	40 %	80 %
3	45 days	22 %	42 %	81 %
4	60 days	23 %	43 %	82 %
5	75 days	25 %	45 %	83 %

**Table 3:** The effect of different doses of Detergent solution on leaf gall in *Mitraygna parvifolia*

S.N.	Days of observation after treatment	Concentration of Detergent solution applied		
		5 gm/L	10 gm/L	20 gm/L
1	15 days	16 %	36 %	73 %
2	30 days	18 %	37 %	74 %
3	45 days	20 %	39 %	75 %
4	60 days	21 %	40 %	75 %
5	75 days	21 %	40 %	75 %

**Table 4:** Effect of Neem leaf extracts treatment on different doses on leaf gall in *Mitraygna parvifolia*

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.905613	2	0.452807	649.9617	5.86E-13	3.885294
Within Groups	0.00836	12	0.000697			
Total	0.913973	14				

P value (5.86E-13) <  $\alpha$  (0.05) and F crit value 3.885294 < F (649.9617), so Null Hypothesis cannot be accepted at the level of significance ( $\alpha$ ) 0.05. Effect of Neem extract spray on the leaf gall in *Mitraygna parvifolia* was found dose dependent.

SS = Sum Square, df = degree of freedom, MS = Mean Square

**Table 5:** Effect of Detergent solution treatment on different doses on leaf gall in *Mitraygna parvifolia*

Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.78528	2	0.39264	1338.545	7.9E-15	3.885294
Within Groups	0.00352	12	0.000293			
Total	0.7888	14				

P value (7.9E-15) <  $\alpha$  (0.05) and F crit value 3.885294 < F (1338.545), so Null Hypothesis cannot be accepted at the level of significance ( $\alpha$ ) 0.05. Effect of Detergent solution spray on the leaf gall in *Mitraygna parvifolia* was found dose dependent.

Groups	Count	Sum	Average	Variance		
20% Neem extract spray	5	4.03	0.806	0.00053		
20 mg/L Detergent solution spray	5	3.72	0.744	8E-05		
Source of Variation	SS	df	MS	F	P-value	F crit
Between Groups	0.00961	1	0.00961	31.5082	0.000502	5.317655
Within Groups	0.0024	8	0.000305			
Total	0.0125	9				
P value (0.000502) < $\alpha$ (0.05) and F crit value 5.317655 < F (31.5082), so Null Hypothesis cannot be accepted at the level of significance ( $\alpha$ ) 0.05, There was significant difference between the results of Neem extract and Detergent solution treated leaf galls in the plant <i>Mitraygna parvifolia</i> .						

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