

## HOST RANGE, INCIDENCE AND DAMAGE OF PINK HIBISCUS MEALYBUG (*Maconellicoccus hirsutus*) INFESTING ORNAMENTAL PLANTS

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### ABSTRACT

Five different locations namely; PSTU campus, BRRI Barishal, RARS Barishal, Dhaka University campus and Mohera Jamidarbari landscapes of Tangail district were selected to study the host range, incidence and damage of the pink hibiscus mealybug. Results revealed that the Pink hibiscus mealybug was found to feed on 22 known host plants from 7 families and 6 unknown host plants. The highest incidence of mealybug per leaf was recorded on century plant and the lowest was on Mussaenda. The highest number of mealybugs per twig was found on Elite patabahar (30) followed by Hibiscus (24) while the lowest number was found on Croton (5). Among five locations the highest percentage of plant infestation was observed at PSTU campus (52%) and the lowest percentage was at BRRI Barishal (35%). The highest percentage of infested leaves per plant was found on Century plant (47%) and the lowest percentage was on Laurentti (12%). The highest percentage of infested twigs per plant was found on Hibiscus (60%) followed by Jatropha (50%) while the lowest percentage was on Maity patabahar (13%). These findings could be helpful to adopt management strategy against Pink hibiscus mealybug in proper time to protect landscape ornamentals and increase beautification.

**Keywords:** Host, Damage, Incidence, *Maconellicoccus hirsutus*, Ornamentals

### INTRODUCTION

The invasive pink hibiscus mealybug, *Maconellicoccus hirsutus* (Green) (Hemiptera: Coccoomorpha: Pseudococcidae) causes severe economic problems throughout tropical and subtropical regions. It seems to be native to Australia or Southern Asia (Roltsch and Meyerdirk, 2008). This exotic insect pest has been spreading through the entire Caribbean region since it was first detected on the Island of Grenada in 1994 (Williams, 1996). Since then, it has spread to Southern California, Mexico,

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Central America, and, in 2002, to Florida (Roltsch and Meyerdirk, 2008) and United States due to its wide economically important hosts (Mani and Shivaraju, 2016). Individuals of the mealybug were found infesting *Hibiscus rosa-sinensis* (Linnaeus) (Malvaceae) in private and public gardens in the urban environment in Rhodes, Dodecanese Islands, East Greece (Milonas and Partsinevelos, 2017).

Part of plant resources were having potential worth as medicinal or ornamental plants which play roles connected with positive shade, protection, and recreation both in private and in public areas as well as to complement and decorate the urban environment (Mazzeo et al., 2014). Ornamental trees, shrubs and flowers have always been extremely popular and there is large demand. Thus, the increase demand of ornamental plant and commercial exchange has provided pests which cause several damages (Mazzeo et al., 2014). Indeed, a great many species of insects attack ornamental plants. Among them, aphids, scale insect, whiteflies, lace insects and mealybug are major (Yovkova et al., 2013; Mazzeo et al., 2014; Ben-Halima, 2009; Ben-Halima et al., 2014). This pest will attack ornamental plants in yards and parks. Its host range is very large, exceedingly over 200 perennial and annual plant species, many of which are important in agriculture and as ornamentals. It is highly polyphagous but particularly thrives on members of the plant families Fabaceae, Malvaceae and Moraceae (Spodek et al., 2016). It feeds by sucking plant sap and attacks more than 300 species in 74 plant families (Hoy et al., 2002). PHM infests more than 250 agricultural and horticultural plant species, including hibiscus, sorrel, mango, avocado, citrus, guava, tomato and peppers. It is also known to infest more than 300 plant species. It feeds on the stems, leaves, buds, fruit, and roots of plants in more than 200 genera in 77 plant families (Culliney, 2014; EPPO, 2005), predominantly woody plants, including many ornamentals (CABI, 2015; Garcia et al., 2015). High populations have been recorded on members of the Fabaceae, Malvaceae and Moraceae and the ornamental plant *Hibiscus rosa-sinensis* is frequently attacked.

Economically important hosts include grapes, citrus, avocado, cotton, *Prunus* spp., *Solanum* spp., and ornamentals. While feeding, the mealybug injects toxic saliva into plants that inhibits cell enlargement, causing stunting of new growth and curling and contortion of leaves. Entire plants may be stunted and deformed. High populations can lead to the death of plants (Hoy et al., 2006). The mealybug can spread long distances through the trade in host plants and fruit. *M. hirsutus* destroys crops and ornamental plants (Hoy et al., 2003). As it feeds, the hibiscus mealybug injects into the plant a toxic saliva that results in malformed leaf and shoot growth, stunting, and occasional death. Leaves show a characteristic curling, similar to damage caused by viruses. Heavily infested plants have shortened internodes leading to resetting or a "bunchy top" appearance (EPPO, 2005; Vitullo et al., 2009; Hoy et al., 2014; García Morales et al., 2016).

Before taking any insect pest management strategy against major insect pest, we should know the host range, incidence pattern and damage symptoms of a particular pest. There is no published research report on these aspects in Bangladesh.

Considering above facts, the present study was undertaken to monitor incidence, plant damage and record plant species affected by pink hibiscus mealybug on ornamental plants in Bangladesh.

### MATERIALS AND METHODS

Five different locations namely; PSTU campus, BRRI Barishal, RARS Barishal, Dhaka University campus and Mohera Jamidarbari landscapes of Tangail district were selected to study the host range, incidence and damage of pink hibiscus mealybug. Sites were chosen defined on the basis of presence of multitude varieties/species of ornamental plant. The survey was carried out from March to November, 2019. Individual plants of different ornamentals grown on pots and landscape of selected locations were inspected. The plant species infested by pink hibiscus mealybug at each location were recorded as hosts.

At each study site, the number of pink hibiscus mealybug (nymphs and adults together) of leaf and twig of each infested host were counted separately to know the incidence pattern. Infested leaves and twigs with mealybugs have first been photographed. The number of healthy and infested plant of each location among ornamentals were recorded separately. The number of healthy and infested leaves was also counted from three randomly selected plants of each ornamental at every location. Likewise, the number of healthy and infested twigs was recorded. The collected data were used to calculate the percentage of plant, leaf and twig infestation by using following formulae:

$$\% \text{ Plant infestation} = \frac{\text{Number of infested plants}}{\text{Total number of plants checked}} \times 100$$

$$\% \text{ Leaf infestation} = \frac{\text{Number of infested leaves}}{\text{Total number of leaves checked}} \times 100$$

$$\% \text{ Twig infestation} = \frac{\text{Number of infested twigs}}{\text{Total number of twigs checked}} \times 100$$

### RESULTS AND DISCUSSION

#### Host range of pink hibiscus mealybug

The Pink hibiscus Mealybug, *M. hirsutus* was found to feed on 22 known host plants from 7 families and 6 unknown host plants (Table 1 and Fig. 7). Several types of patabahar plants and various crotons (Table 1 and Fig. 6: a-i) of the species *Codiaeum variegatum* and genus *Croton* under the family Euphorbiaceae were

recorded. Besides these Jatropha, Copper leaf, Khato bahari, Ceylon bahari, hedge Acalypha and Poinsettia were also found as host plants belongs to the family Euphorbiaceae (Table 1 and Fig 6: j, o, p, q,s v). The yellow and red jaba of ornamental plant species *Hibiscus rosa-sinensis* of Malvaceae family is frequently and severely infested by pink hibiscus mealybug. Donna aurora (White), *Mussaenda philippica* and Coccinea rangon, *Ixora coccinea* under the family Rubiaceae were also the hosts of *M. hirsutus*. The family Rosaceae had only one host plant *Rosa* spp. of *M. hirsutus* in the present study. Century plant, Laurenttia and Angiisar of Asparagaceae family were also attacked by this mealybug. Heliconia (*Heliconia* spp.), Coleus (*Coleus* sp.) of Heliconiaceae, Lamiaceae families, and Angiisar were recorded as hosts of *M. hirsutus* (Table 1).

Table 1. Host range of pink hibiscus mealybug infesting ornamental plants

SI No	Host Name	Scientific Name	Family
1	Maity patabahar	<i>Codiaeum variegatum</i>	Euphorbiaceae
2	Maity patabahar	<i>Codiaeum variegatum</i>	Euphorbiaceae
3	Elite patabahar	<i>Codiaeum variegatum</i>	Euphorbiaceae
4	Elite patabahar	<i>Codiaeum variegatum</i>	Euphorbiaceae
5	Crispum	<i>Codiaeum variegatum</i>	Euphorbiaceae
6	Croton	<i>Croton</i> spp. L.	Euphorbiaceae
7	Jatropha/Coralbush	<i>Jatropha glandulifera</i>	Euphorbiaceae
8	Yellow jaba	<i>Hibiscus rosa-sinensis</i>	Malvaceae
9	Red jaba	<i>Hibiscus rosa-sinensis</i>	Malvaceae
10	Rose	<i>Rosa</i> spp.	Rosaceae
11	Donna Aurora (White mussaenda)	<i>Mussaenda philippica</i>	Rubiaceae
12	Copperleaf	<i>Acalypha hispida</i>	Euphorbiaceae
13	Khato bahari/copperleaf	<i>Acalypha wilkesiana</i>	Euphorbiaceae
14	Ceylon bahari/copperleaf	<i>Acalypha wilkesiana</i>	Euphorbiaceae
15	Coccinea Rangan	<i>Ixora coccinea</i>	Rubiaceae
16	Hedge Achlypha	<i>Acalypha siamensis</i>	Euphorbiaceae
17	Century plant /Maguey/American aloe	<i>Agave americana</i>	Asparagaceae
18	Heliconia	<i>Heliconia</i> spp.L.	Heliconiaceae
19	Poinsettia	<i>Euphorbia pulcherrima</i>	Euphorbiaceae
20	Laurentii	<i>Dracaena trifasciata</i>	Asparagaceae
21	Coleus	<i>Coleus</i> spp.	Lamiaceae
22	Angiisar leaflets	<i>Cordyline terminalis</i>	Asparagaceae
23	Unknown hosts (6)		

### Incidence of pink hibiscus mealybug per leaf

The incidence of pink hibiscus mealybug per leaf on different ornamental plants is presented in Figure 1. The highest number of mealybug was recorded on century plant (46/leaf) followed by maity patabahar (25/leaf), *Acalypha hispida* (14/leaf), Elite (13/leaf) and Croton (12/leaf). The lowest number was on Mussaenda (5) followed by Hibiscus (6), Poinsettis (7), Crispum (8), Laurentti (8) and Cylonbahari (9).

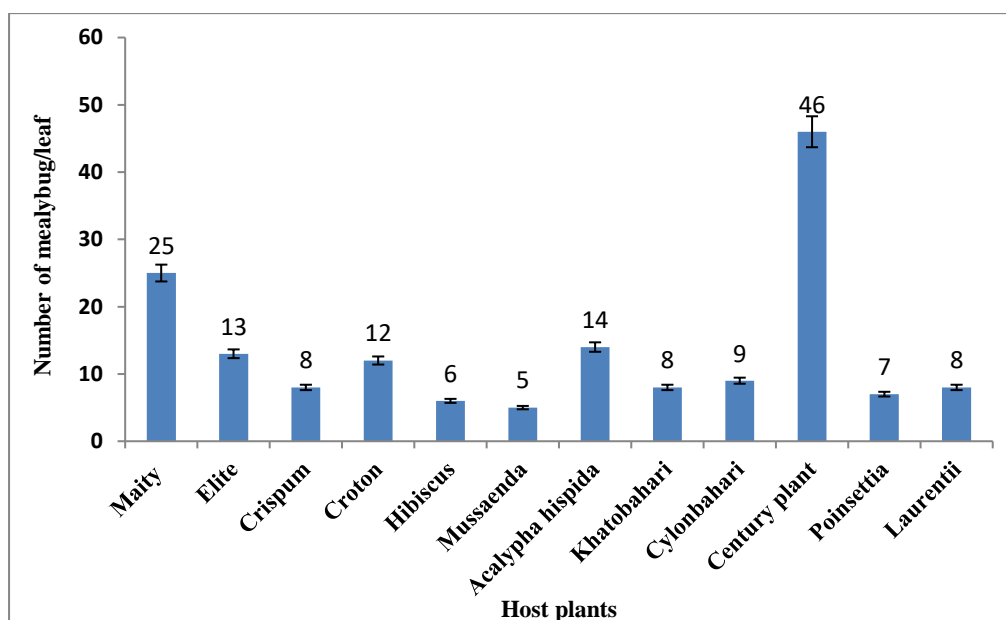


Figure 1. Number of pink hibiscus mealybug per leaf on ornamental host plants

### Number of pink hibiscus mealybug per twig

Figure 2 revealed that the highest number of mealybugs per twig was found on Elite patabahar (30) followed by Hibiscus (24), Mussaenda (18) and Poinsettia (15). The intermediate number of mealybugs was recorded on Rose (10), Khatobahari (10) and Crispum (12). The lowest number was on Croton (5) followed by Acalypha hispida (6), Cylonbahari (7), Jatropha (8) and Maity patabahar (9).

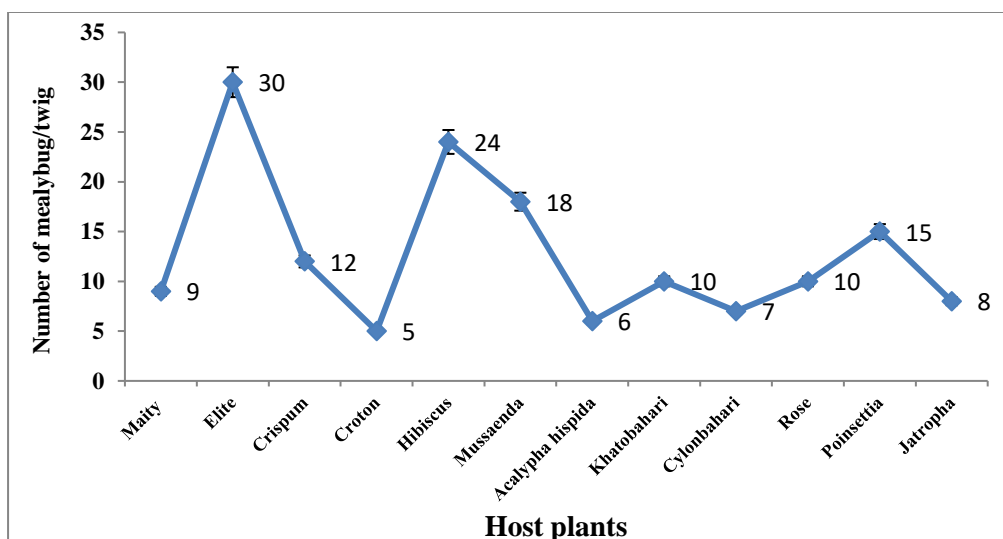


Figure 2. Number of pink hibiscus mealybug per twig on ornamental host plants

### Damage caused by pink hibiscus mealybug

#### Percentage of plant infestation

Among five locations the highest percentage of plant infestation was observed at PSTU campus (52%) followed by RARS Barishal (47%) and Dhaka varsity campus (40%) while the lowest percentage was recorded at BRRI Barishal (35%) followed by Mohera Jamidarbari (38%) (Figure 3).

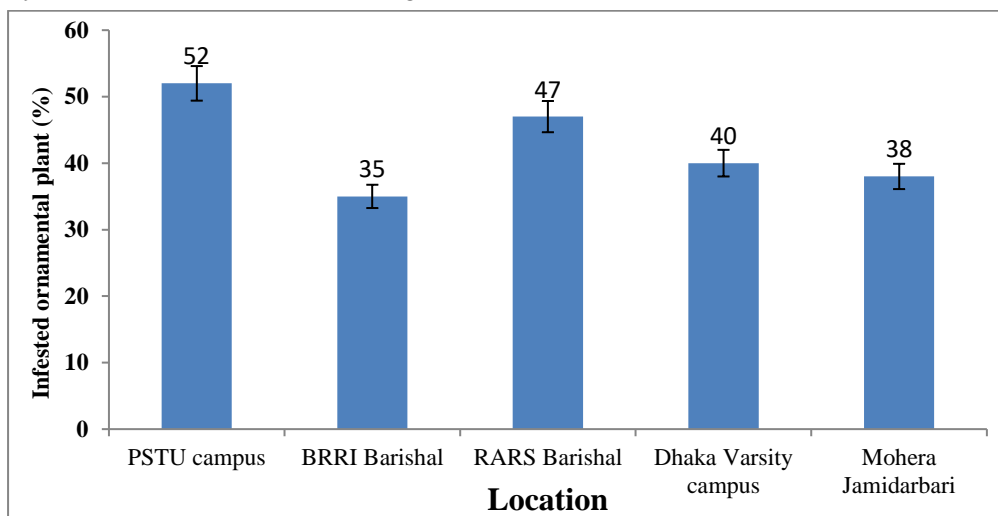


Figure 3. Percentage of infested ornamental plant by pink hibiscus mealybug at various locations

### Percentage of leaf infestation per plant

Figure 4 illustrated that the highest percentage of infested leaves per plant was found on Century plant (47%) followed by Crispum (45%), Maity (40%) and *Acalypha hispida* (35%). The moderate percentage of infested leaves was observed on Croton (30%), Poinsettia (27%), Elite (25%) and Hibiscus (24%). The lowest percentage of infested leaves was recorded on Laurentii (12%) followed by Mussaenda (15%), Cylonbahari (18%) and Khatobahari (20%).

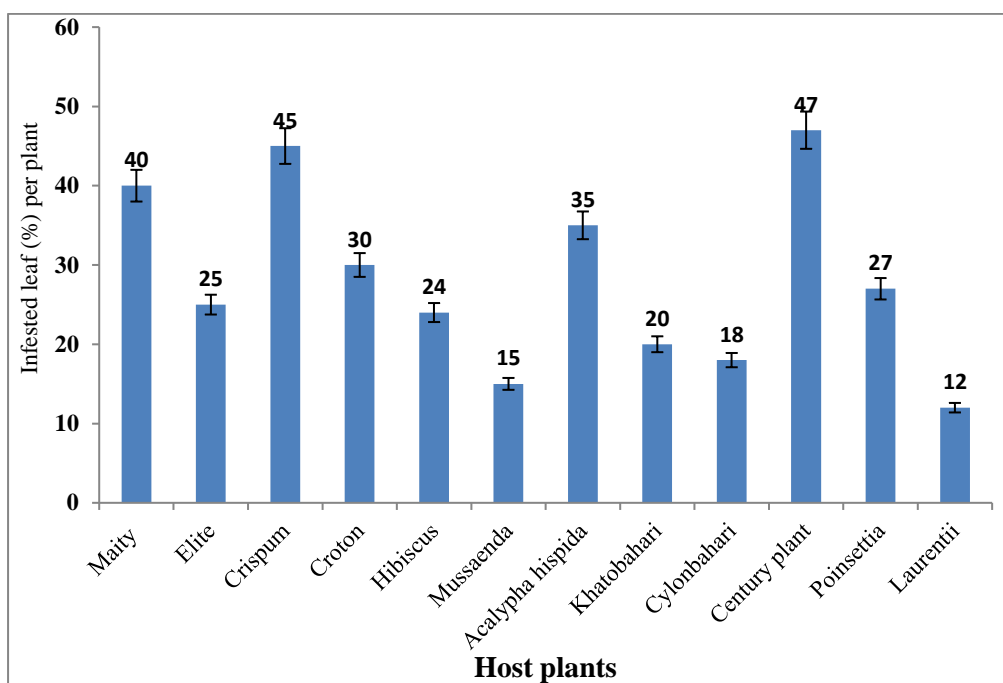


Figure 4. Percentage of infested leaves per plant by pink hibiscus mealybug on ornamental host plants

### Percentage of infested twig per plant

The highest percentage of infested twigs per plant was found on Hibiscus (60%) followed by *Jatropha* (50%), Poinsettia (43%) and Elite (40%). The moderate percentage of infested twigs was observed on Mussaenda (27%), Crispum (25%), Khatobahari (22%) and Rose (20%). The lowest percentage of infested twigs was recorded on Maity (13%) followed by, Cylonbahari (14%), *Acalypha hispida* (16%) and Croton (18%) (Fig 5 and Fig 1).

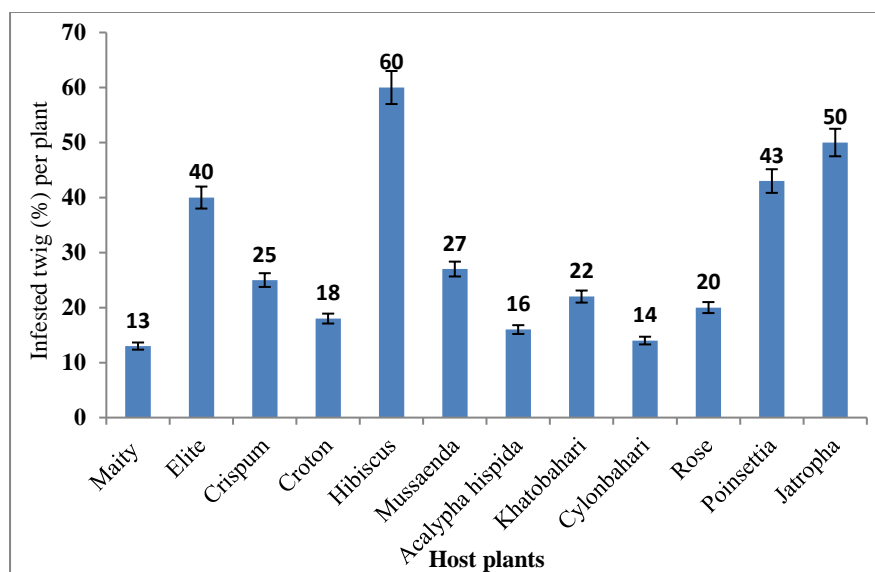


Figure 5. Percentage of infested twig per plant by pink hibiscus mealybug on ornamental host plants

As it is polyphagous, feeding on 28 ornamental plants belonging to over 7 families in the present study which is comparable to the findings of Kairo et al. (2000) who stated that this species has only developed seriously damaging on fewer than 20 host-plant species. It is a primary consumer that also attacks ornamental plants such as the rose and hibiscus (Reddy et al., 2009). It is also feeding on 200 genera of plants belonging to over 76 families, predominantly woody plants, including many ornamentals (Ben-Dov and German, 2003; CABI, 2015; Garcia et al., 2015). The mealybug is found on stems, leaves, buds, fruit and roots of many plants. On hibiscus, the mealybug usually infests young twigs, causing deformed terminal growth due to shortening of the internodes, deformed leaves and thickened twigs. In cotton, the growing parts are attacked, resulting in bunched growth (Williams, 1996). The level of feeding damage depends on the vigor of the infested plant; seedling trees and weakened trees are more susceptible. Shoots become twisted with shortened internodes, forming bunched heads of small bushy leaves at the tips. The curled leaves can resemble viral damage, but this pest is not known to vector of any diseases. Heavy infestations of young plants by the pink hibiscus mealybug may stunt their growth (Williams, 1996). The feeding of the PHM causes new leaves to curl and young stems to stop elongating and become thick. This gives the plant a “bunched top” appearance. This damage is caused by a toxin that the PHM injects into a plant as it feeds (Hoy et al., 2003). None of the other common mealybugs cause this type of damage.





Figure 6 (a-i): (a) *Codiaeum variegatum* (Maity), (b) *Codiaeum variegatum* (Maity), (c) *Codiaeum variegatum* (Elite), (d) *Codiaeum variegatum* (Crispum) (e) *Codiaeum variegatum* (Elite), (f, g, h & i) various kinds of croton.

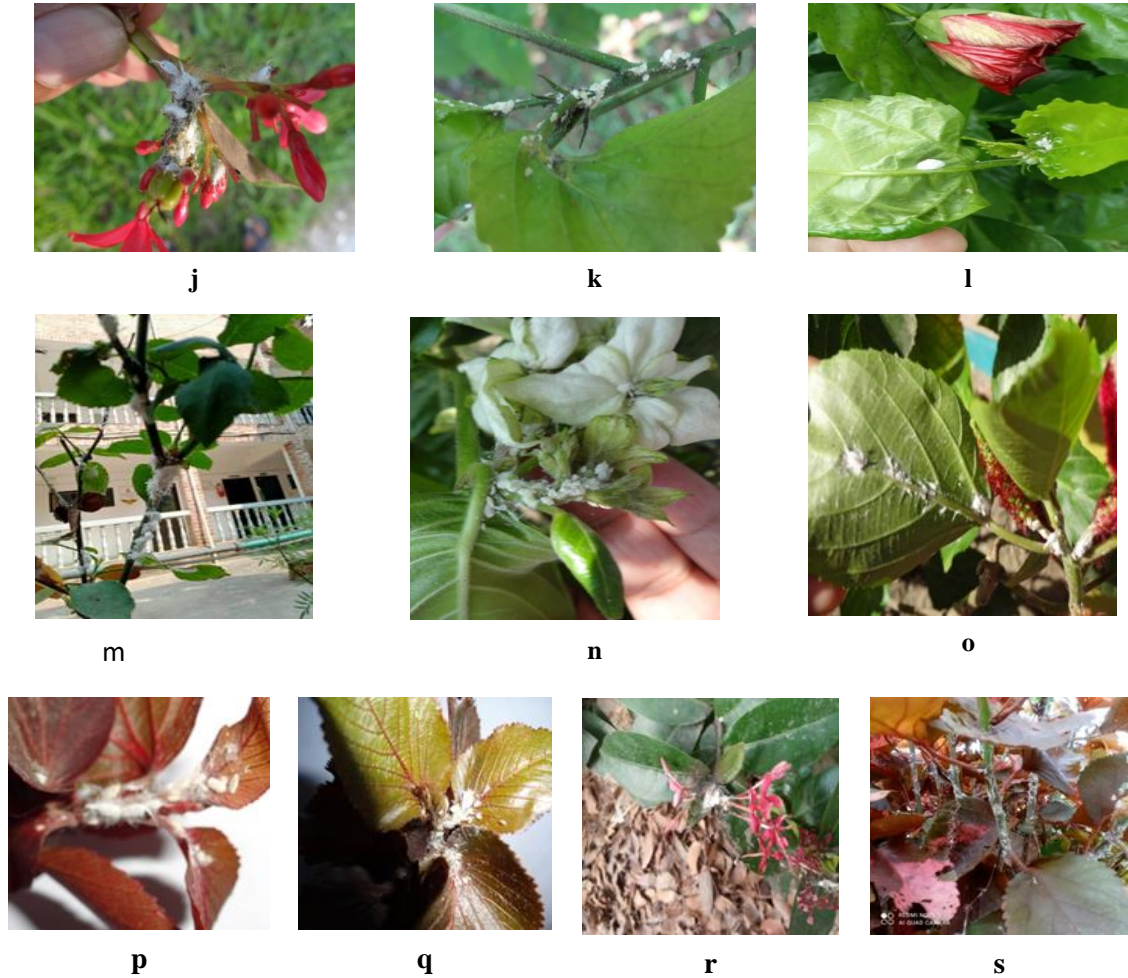


Figure 6 (j-s): (j) *Jatropha glandulifera* (C/N: Jatropha, Coralbush), (k) *Hibiscus rosa-sinensis* (C/N: Yellow jaba), (l) *Hibiscus rosa-sinensis* (C/N: red jaba), (m) Rose (n) *Mussaenda philippica*, (o) *Acalypha hispida*, (p) *Acalypha wilkesiana* (Khato Bahari) (q) *Acalypha wilkesiana* (Ceylon Bahari), (r) *Acalypha wilkesiana* (Coccinea rangan), (s) Hedge *Acalypha*.

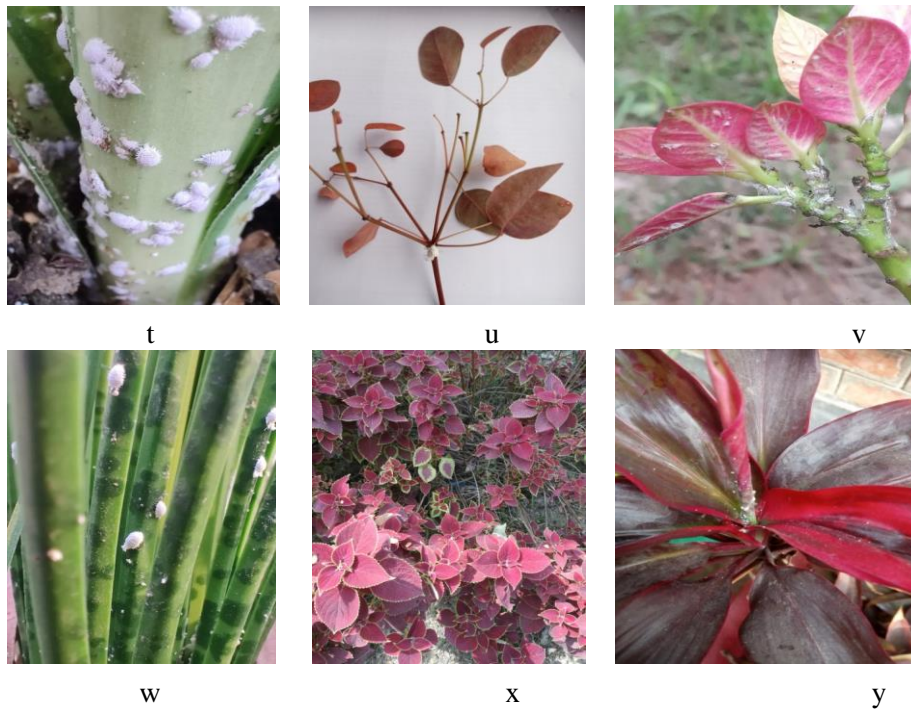


Figure 6 (t-y). (t) *Agave americana* (Medio-Picta/Century plant), (u) *Heliconia*, (v) *Poinsettia*, (w) *Laurentia*, (x) *Coleus* and (y) *Cordyline terminalis* (Agnishar)

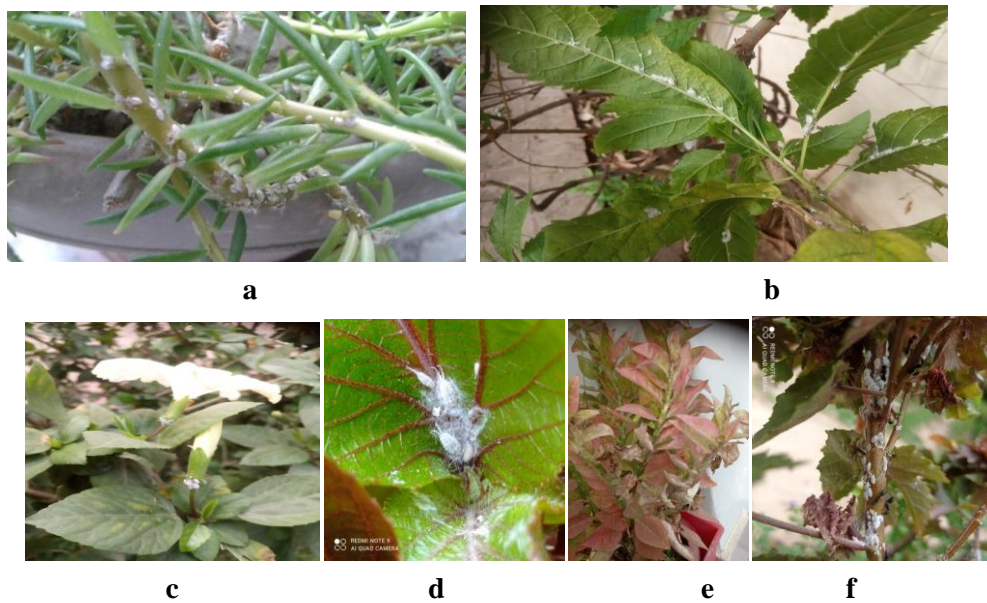


Figure 7 (a-f). Unknown host plants infested by Pink hibiscus mealybug

## CONCLUSION

The highest abundance and leaf infestation were found on Century plant and Elite patabahar. The twigs of Hibiscus and Jatropha were highly infested by Pink hibiscus mealybug. The bunched top appearance on leaves and young stems caused by this mealybug.

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