

## Conference Paper

# Recent Status of Pests and Diseases on Cut Roses in Batu East Java

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**Abstract**

Rose is one of the most important ornamental plants in Indonesia. Almost 57.02% of the national cut rose's demand was supplied from East Java, mainly from Batu. However, in the production process, there are various problems, especially pest and disease damages. In this regard, a study was conducted to determine recent status of the pests and diseases on roses in cultivation center of Batu, East Java. Observation was carried out in the farmers' field randomly, from October to December 2014. Observation was performed on type and damage intensity of the pests and diseases. The pests and plant damage were sampled for further identification. An interview was made with some farmers to get secondary data about the type and the importance of the pests and diseases as well as the effort for controlling them. The result showed that some pests and diseases found included aphid, armored scale insect, spider mite, thrips, black spot, crown gall and powdery mildew. Based on morphological identification, there were two families of armored scale insect, i.e., Coccidae and Diaspididae. The highest damage intensity was due to armored scale insect, thrips, black spot and crown gall with the percentage of damage intensities of 50.50%, 20.00%, 45.50% and 65.00%, respectively. Based on those data, scale insect, thrips, black spot and crown gall were classified as important pests and diseases on roses in this area. Some pesticides and other materials like petroleum oil and detergent were used by the farmers to control either pests or diseases, but they were ineffective, especially in controlling armored scale insect and crown gall.

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## 1. Introduction

Rose is one of the most popular ornamental plants in Indonesia. This ornamental plants are usually grown at high altitudes, such as in Cipanas and Lembang in West Java, Bandungan in Central Java, Batu in East Java, Berastagi in North Sumatra, Bedugul in Bali, and Tomohon in North Sulawesi. Every year, consumer's demand for roses as cut flowers tends to increase in line with population growth, welfare and public

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interest on ornamental plant. According to Indonesian Statistic Center [1], the planting area of roses in Indonesia in 2013 was about 113.47 ha with the production reached 104,975,942 stalks, while in East Java was about 60.35 ha with the production of flower 59,854,971 stalks or approximately 57.02% of the national production.

Rose cultivation for the cut flower in the Batu area, the main center of rose cultivation in East Java, is conducted in open fields, conversely to the other regions in Indonesia which were generally carried out in plastic house. Besides influencing the productivity and quality of the flowers, this open field cultivation may affect the existence or status of pests and diseases as an obstacle in rose cultivation. High intensity of pest and disease damages can reduce the quantity and quality of the roses.

Until now, reports on pests and diseases of roses in Batu cultivation area is still limited. The aim of this study was to determine the status of important pests and diseases in this location, so that precise target as well as effective and efficient control methods can be prepared.

## 2. Materials and Methods

The research was conducted in farmers' crops at the cultivation center of the rose cut flowers in Gunungsari village, Batu sub-district, from October to December 2014. The pest and disease observations were performed randomly at several farmers' fields. The collected data included the type, symptom and damage intensity of the observed pests and diseases. To obtain secondary data, interview was conducted with four rose farmers in order to get information about the most important pests and diseases for the farmers, control methods and the types of pesticides used. The identification of invented pests and diseases was performed based on literatures to determine the types of pests and diseases found in the rose cultivation.

## 3. Results and Discussion

### 3.1. Types of pests and diseases and their damage symptoms

Several types of pests and diseases such as aphids, thrips, scale insects, spider mites, black spot, powdery mildew and crown gall disease were found in rose cultivation area in this study (Table 1 and Figure 1). The results also showed that the types of pest or disease that cause damage to the rose plants depended on rose varieties, plant age, plant maintenance, and control method of pest and disease (Figure 2).

Aphids were commonly found in young shoot and flower bud, mainly on the plants that are lack of intensive maintenance by the farmers. This pest damages the plants by sucking plant fluids so that the leaves or flowers will not grow normally (Table 1).



**Figure 1:** Pests (left) and diseases (right) of Rose and their symptoms in Batu, East Java.

Hoffer et al. [2] stated that the physical impact of most aphids is minimal and they do not spread any rose diseases. Aphid reproduction is parthenogenesis and it is a rapid and efficient way for insects to colonize a plant. Aphids feed on plant cell contents and sap by piercing the plant and sucking up the liquids. This feeding method requires a sedentary lifestyle, and most aphids remain in one small area for their entire lives.

According to the farmer's information, the pests do not cause significant damage and can be easily controlled with insecticides. Aphids are offensive, often clustering in large colonies on and below young flower buds and tender unfolding leaves. Larger colonies of feeding aphids can weaken flower bud necks and distort leaf growth [2].

Another pest found in rose was armored scale insect. Several species of armored scale occurred on roses, with rose scale being one of the more common. From identification, there were two families of scale insect, i.e., coccidae and diaspidae (Figure 1/ Table 1). Layton [3] specified that scale insects do not look like insects at all. Their bodies are covered with a hard, scale-like covering that may be rounding, elliptical, tear-shaped, or oyster shell-shaped, depending on species. These scale covers often blend in with the bark of the plant, making the scale difficult to see. Females deposit eggs underneath their scale covers. The eggs hatch into tiny crawlers that move a short distance from their mothers and insert their mouthparts into the plant. There they begin to feed and form their scale covers. From this point on, they remain in this location. If they are females, they do not move at all for the rest of their lives. It is reported that the crawlers are the only stage that contributes to active dispersal, but only on very small distance [4]. The mortality is high in this phase. Passive dispersal occurs by transport on plants, humans, animals, and air movements.

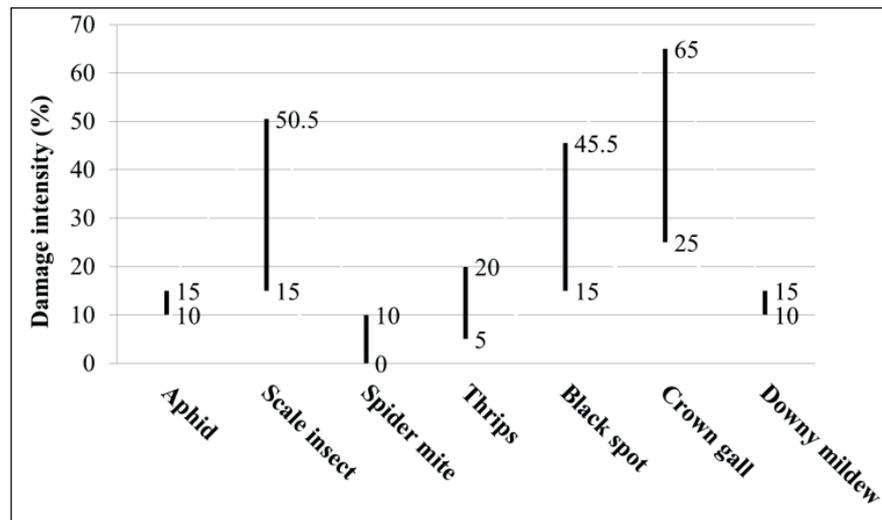
Damage intensity of this pest ranged from 15 up to 50.5% (Figure 2). Based on its damage and impact on the crop, the pest is classified as an important pest in this area.

TABLE 1: Types of pests and diseases, damage symptoms and its status on rose cultivation in Batu Malang, 2014.

Pest/Disease	Damage symptom	Status
Aphid	Aphids feed on plant sap with their piercing-sucking mouthparts, causing distortion of young leaves and stunting new growth. Their feeding results in distorted growth. Heavy infestations can reduce the number and quality of blooms. As they feed, aphids excrete honeydew, a sugary substance that attracts ants and wasps. The honeydew supports the growth of unsightly, dark-colored sooty mold fungi on the leaves.	+
Thrips	The adult and larval stages feed by piercing the flower surface with their mouthparts and sucking the contents of cells. This causes brown spots on the petals where the cells have been destroyed. These spots are also speckled with dark fecal droppings from the thrips. This damage usually can be seen clearly on bright flower (white, light pink and light yellow). Feeding on petals may result in petals streaked with silvery-white or brown as well as petals with browning edges. White and light-colored rose blossoms appear to be particularly attractive to thrips.	+
Scale insect	Scales or shell-like bumps on the upper side and underside of leaves. Scale insect excretes honeydew, which accumulates on the upper leaf surfaces. Under damp conditions this can be colonized by a black non-parasitic fungus sooty mold. Scale infestations reduce plant vigor and growth. Heavy infestations cause the death of whole canes or even whole plants.	++
Spider mite	Early damage is seen as yellow or white speckling on the leaf's upper surface. Fine webbing may be seen on the undersides of leaves. With severe infestations, leaves may develop a grayish green or bronze color, and webbing may cover both sides of leaves as well as branches. Severely infested leaves may drop prematurely.	+
Black spot	The symptoms are circular black spots with indistinct or jagged margins that are frequently surrounded by a yellow halo. Infected leaves turn bright yellow and fall prematurely when the attack is severe. Repeated defoliation occurs, greatly weakening the plant.	++
Crown gall	Galls start as pale green or white but turn brown and become corky with age. Plants with crown gall may be stunted and have weakened stems and foliage. Crown gall causes abnormal growths or galls on roots, twigs, and branches. The galls are often found at the base of a plant or just below the soil surface. As the galls enlarge, they become woody and hard. The outer layer turns brown and corky.	+++
Downy mildew	Powdery mildew is seen as a light gray or whitish powder on the upper surface of leaves. Powdery mildew is characterized by white powdery growth, masses of spores on young leaves, shoots and buds and sometimes-open flowers. Foliage may be distorted, and shoots stunted or swollen.	+

Legend: + = rather important; ++ = important; +++ = very important

The rose scale causes direct damage by sucking sap from leaves, twigs and fruits, resulting in growth inhibition, discoloration of leaves and fruits, death of twigs and loss of production [5]. At high density, the stalks and wood are covered with a white coating and can lead to the death of the whole plant [4]. Young nymphs are easy to control, but the adult females are difficult to reach with insecticides. Chemical control of scale insects is extremely difficult, because the pest spends most of its life hidden under its impenetrable shield.



**Figure 2:** Range of damage intensity of pests and diseases in farmers rose gardens in Batu East Java.

The other pest found in roses was red mites. The presence of these pests was indicated by the presence of fine webs on both leaf surfaces. The pests damage the leaves, especially young leaves by sucking the liquid. As a result, the leaves looked gloomy, thus affecting the overall appearance of the plant. Mite attack causes the flowers fail to bloom and have muddy color [6]. These pests multiply quickly in hot and humid weather conditions, and also when air circulation around the garden is not good. Damage intensity of this pest in this location was very low, ranging from 0 to 10%. This matter closely related to the condition of rose cultivation in Batu which was conducted in open field by farmers. This is in accordance with the opinion of Maryam et al. [6] who stated that mites are important pests on roses in plastic house and prefer a shaded place.

The other pest found was thrips which generally attacks flowers bud. The feeding may result in distorted buds that open only partially or abort prematurely. Feeding on petals may result in petals streaked with silvery-white or brown as well as petals with browning edges. Young leaves may be distorted and flecked with yellow as a result of thrips feeding (Figure 1/Table 1). Hoffer et al. [2] stated that various thrips species feed on roses. Two of the most common are flower thrips (*Frankliniella tritici*) and western flower thrips (*F. occidentalis*). Both immature and adult thrips feed by scraping surface cells to suck plant sap. Adults and larvae feed in a similar manner, so both stages contribute to plant damage. Individuals tend to feed in localized areas, which results in silvered or necrotic patches on foliage, flowers and fruit. Damage intensity of this pest ranged from 5 to 20%. Based on its damage intensity, this pest was classified as an important pest in this area. Feeding within developing buds leads to deformation of leaves or flowers [7]. Extensive feeding can also result in flower and fruitlet abortion,

which is a direct yield loss. Adult and larval feeding causes considerable aesthetic damage to ornamental and fruiting crops [8].

Black spot was one of diseases on roses in this area. The disease is caused by *Diplocarpon rosae* which is generally found in a rose plantation in West Java [9]. Hoffer et al. [2] reported that leaves infected with black spot will produce the plant hormone ethylene. High ethylene content in leaves causes leaf drop. As a result, rose plants infected with black spot lose their leaves early and look bare. Damage intensity of this disease is high ranging from 15 up to 45%. The highest intensity of damage found in plants that are not maintained properly. The disease will rapidly spread from old leaves to young leaves, especially during the rainy season or warm weather. Newly emerging leaves are most susceptible to this fungus [2]. If a leaf surface stays wet for 24 hours or longer, spores germinate and grow into the leaf tissue. Once the fungus is established in plant tissues, it grows and produces spore-forming structures on plant surfaces. Eventually, as the disease spreads, the entire leaves will go from green to yellow and then drop to the ground. The entire rose bush may become defoliated. Leaves less than two weeks old are the most susceptible to this disease. Based on the high damage intensity and their impact to the crop, the disease was classified as important pests in this area.

Another disease on rose was crown gall. Almost all the planting locations attacked by the disease (Figure 1/Table 1). According to Hartman and Eshenaur [10] this disease caused by the soil-borne bacterium, *Agrobacterium tumefaciens*. This organism enters susceptible plants through fresh wounds made during transplanting, cultivating, grafting and pruning. Other wounds inflicted by people, severe weather, insects or other animals may also serve as avenues of infection. The bacteria enter the plants through wounds and the higher the inoculum the bigger the galls and the severe the infection.

Damage intensity of this disease ranged from 25 to 65%. Cutting of branches or all plants that infected by crown gall without equipment sterilization disinfectant may accelerate the spread of the disease in this area. According to the farmers information, plants with many thorns are more susceptible to crown gall disease than plant with few thorns. Maina et al. [11] reported that rose plants infected by *Agrobacterium* manifest slower growth, stunting, yellowing and chlorotic leaves and fail to produce healthy flowers. These symptoms appear in many crop farmers observed. Roses that have crown gall develop rounded tumors which are brown to brownish black in color, and develop from smooth spongy to rough texture with age. Severe infection causes plants to grow abnormally, fail to flower and eventually die. Based on the highest damage intensity and the effect on the crop, this disease was classified as an important pest in this area.

The last disease found in this area was powdery mildew. Suhardi and Saepullah [12] suggested that the pathogenicity of powdery mildew caused by *S. pannosa* var.

TABLE 2: Pesticides used by farmers to control pest and disease of roses in Batu Malang, 2014.

Pest/Disease	Kinds of pesticide
Aphid	Decis, Marshal, Confidor, Arrivo, Dursban
Thrips	Demolish, Keltane, Pegasus, Confidor
Scale insect	Detergent, Marshal, Confidor, Supracide
Spider mite	Kelthane, Omite, Mitac
Black spot	Antracol, Dithane, Delsene, Daconil, Rampart
Crown gall	Petroleum oil, Bactomycin
Downy mildew	Antracol, Cupravit, Masalgin, Dithane, Amistar, Folicur

*rosae* on roses is specific only to attack roses. Symptoms start as yellowish to brown blotches on upper surface of the leaves. The blotches may frequently occur along the leaf margins. Under moist, cool conditions leaves may turn yellow and drop. A white, downy fungus growth may occur on the lower surface of the leaves. This disease is one of the important crops cultivated roses in plastic house and if not controlled can cause serious damage, especially in the highlands [13]. The disease attacks the leaves, flower stalks, petals especially in flower have not been opened [14]. Damage intensity of this disease in this area only ranged from 10 to 15%. The disease is considered more unsightly than harmful. Dry warm days followed by cool, humid nights are ideal for development of powdery mildew on roses. Spores of powdery mildew are usually not spread by splashing water, but by wind-borne spreading through natural air movement as well as fans. Disease may be apparent within one week of infection and immature leaves are very susceptible [14].

### 3.2. Pest and disease control by farmers

To control pests and diseases, various attempts have been made by the farmers including plant watering, spraying pesticides, mechanical means, good farming practices. In addition to wet the plants, watering with high pressure in the dry season is also intended to control pests such as aphids, scale insects, spider mites and thrips. As a result, the pests will fall to the ground, so it can not damage the plants. Thus the use of pesticides can be minimized. Some pesticide and other chemicals like petroleum oil and detergent were sprayed by the farmers (Table 2), but they were ineffective, especially to control armored scale insect and crown gall.

Another way often carried out by farmers to control pests and diseases is pruning of plants or plant parts attacked and then destroying them by burning. Unfortunately, many farmers do not perform equipment sterilization, especially when pruning of plants parts that are infected by crown gall disease. Nevertheless, some farmers have started a good agriculture practice through seed healthy choice, using organic

and inorganic manure, intensive maintenance, controlling of pests and diseases with mechanical, physical, and chemical technique.

## 4. Conclusions

1. Some pests and diseases were found on roses in the area of Batu East Java, i.e., aphid, armored scale insect, spider mite, thrips, black spot, crown gall, and powdery mildew.
2. Based on the highest damage intensity, scale insect, thrips, black spot and crown gall were classified as important pests and diseases.
3. Some efforts to control pests and diseases of roses were made by the farmers such as plant watering, pesticide spraying, mechanical technique and good farming practices.

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