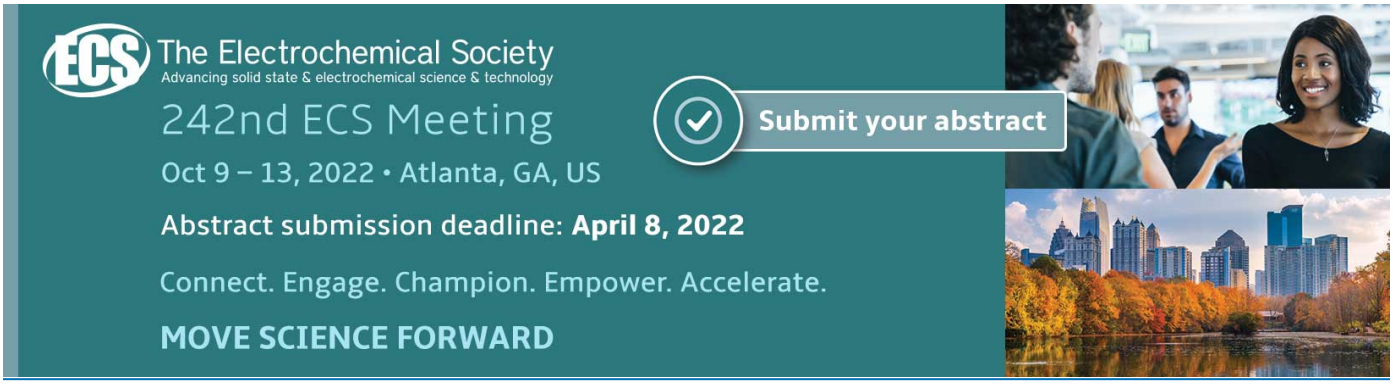
# Health identification of *Shorea javanica* Koord. and valeton in nursery





# Health identification of *Shorea javanica* Koord. and valeton in nursery

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**Abstract.** *Shorea javanica* Koord. and Valeton is an identity tree of Lampung Province. The dammar of this species, locally known as damar mata kucing (cat-eye resin). The population of *S. javanica* is mostly in Repong Damar and grows naturally in Bukit Barisan Selatan National Park. Within a decade, the damar mata kucing production was decreased. The threat of deforestation, land degradation, and the scarcity of regeneration were some of the causes. One of the important efforts that could be done was to procure quality seedlings in the nursery. Knowledge of the health condition of seedlings in a nursery is very important in supporting plant cultivation success. Plant insects and diseases were one of the determining factors. This study aims to determine the health of *S. javanica* seedlings in South Lampung Permanent Nursery, which Way Seputih Way Sekampung Watershed Management Center and Protected Forest manage. This seed health identification activity used the Systematic Random Sampling method with a sampling intensity of 10%. The samples obtained were carried out by identifying the type of damage, location of damage, and severity of all *S. javanica* seeds sampled using criteria and standards for crop assessment results according to the International Center's Environmental Monitoring standards Assessment Program (EMAP). Based on the result of the research, from 100 seedlings of *S. javanica* that was observed 75% of seedlings are unhealth, and 25% of seedlings are healthy. Among the 75% unhealthy seedling, 2% were dead. The intensity of total attack is about 73%, the intensity of insect attack is about 41%, and disease attack intensity is 32%, with the highest attack severity 30-39%. The results showed that the live percentage of *S. javanica* seedlings was 98% which was in the very good category.

## 1. Introduction

*Shorea javanica* Koord. and Valeton is an identity tree of Lampung Province. *S. javanica* is endemic to Indonesia and has been put forward as a candidate for the IUCN red list of endangered plant species (Ministry of Indonesian Forestry; https://www. forestry.go.id). This plant produces a resin that is locally known as damar mata kucing (cat-eye resin). The damar mata kucing was an important commodity in Indonesia more than a century ago. Most of the population of *S. javanica* in Lampung is maintained in Repong Damar and grows naturally in Bukit Barisan Selatan National Park [1]. Repong damar is an agroforestry garden with the dominant plant *S. javanica*, a source of producing the damar mata kucing for the community in Krui, West Lampung [2]. Within a decade, the damar mata kucing production was

decreased. The threat of deforestation, land degradation, and the scarcity of regeneration were some of the causes [1,3]. One of the important efforts that could be done was to procure quality seedlings with maintaining health and protecting the seedlings in the nursery.

The permanent nursery of the Way Seputih Way Sekampung Watershed and Protected Forest Management Center (BPDASHL WSS) is one government agency that propagates quality seeds and seedlings in Lampung. The available seeds and seedlings are used for forest and land rehabilitation activities and distributed to the community to plant on community forest lands. In providing good quality seedlings, knowledge of the health condition of seedlings in a nursery is very important as criteria for seedling selection as one effort for the success of plant cultivation. Plant pests were one of the determining factors. An unhealthy plant has characteristics of insufficient growth, has no straight stems, has pale yellowish leaves, and has been attacked by insects and diseases (Forestry Minister Regulation No. P.03 / MENHUT-V / 2004). Knowledge of potential types of pests in plants is needed as a basis to determine pest control measures. In addition, information on the potential types of insects and diseases is also needed to be aware of the explosion of the insects and diseases at one time so that the appropriate preventive action can be taken [11]. From some of these factors, it is essential to know the health condition of the plants at the seedling stage to reduce the failure of *S. javanica* when planted in the field. This study aims to determine the health of *S. javanica* seedlings in South Lampung Permanent Nursery, which Way Seputih Way Sekampung Watershed Management Center and Protected Forest (BPDASHL WSS) manages.

## 2. Materials and methods

This study was carried out in the permanent nursery of the Way Seputih Way Sekampung Watershed and Protected Forest Management Center (BPDASHL WSS) in South Lampung. The tools used in this study were a camera to document research materials, a calculator to calculate data, a ruler to measure seedling height, a loop to see small insects and diseases, a tally sheet, and other supporting tools. The materials used were 100 *S. javanica* seedlings from a total of 1000 seedlings in the nursery. The number of test samples used was taken using a systematic sampling method with a random start referring to the sampling requirements of SNI 01-5006.1 2005 (table 1). The first sampling was done randomly, but it was carried out systematically according to a specific interval. The interval size between taking one sample and another is done by dividing the population by the number of samples to be taken [4].

**Table 1.** Number of test samples by seedling population.

| Seedling population | Number of test samples |
|---|---|
| < 100.000 | 100 seedlings |
| 100.000-1.000.000 | 1000 seedlings |
| >1.000.000 | Sampling intensity 0,2% |

Source: SNI 01-5006.1 2005

Observation and data collection was done by observing the seedling, one by one; they included the symptom, cause of damage, the location of damage in the seedling, and type of damage. The level of severity of the damage was determined by calculating the ratio of the damaged part to the whole seedling. According to Environmental Monitoring and Assessment Program (EMAP) (modification), the observation results were checked using the criteria and standards of plants assessment results. The observation results were then processed based on the cause of damage consisting of 11 codes (table 2), parts of the damage seedling consisting of 6 codes (table 3), type of damage consisting of 12 codes (table 4), and the level of severity consists of 8 codes (table 5).

**Table 2.** Cause of damage.

| Code | Specification |
|---|---|
| 001 | Dead |
| 100 | Insect |
| 210 | Wound |
| 200 | Disease |
| 300 | Fire |
| 400 | Animal |
| 500 | Weather |
| 600 | Plant Competition |
| 700 | Human Activity |
| 800 | Unknown Cause |
| 999 | Besides the existing criteria |

**Table 3.** Parts of the damaged seedling.

| Code | Specification |
|---|---|
| 0 | No Damage |
| 4 | Under Trunk |
| 5 | Top Trunk |
| 6 | Branch |
| 7 | Shoot |
| 8 | Leaf |

**Table 4.** Type of damaged.

| Code | Specification |
|---|---|
| 01 | Cancer |
| 02 | Conk, fruiting bodies, and other indicators of advanced |
| 03 | Open wounds |
| 04 | Resinosis or gummosis |
| 11 | Broken bole on roots |
| 12 | Water Bud |
| 21 | Dead Shoot |
| 22 | Fracture And Dead |
| 23 | Excessive branching or brooms |
| 24 | Damaged Leaf |
| 25 | Discoloration of foliage |
| 31 | Other damages |

**Table 5.** Level of severity.

| Code | Specification (%) |
|---|---|
| 2 | 20-29 |
| 3 | 30-39 |
| 4 | 40-49 |
| 5 | 50-59 |
| 6 | 60-69 |
| 7 | 70-79% |
| 8 | 80-89% |
| 9 | 90-99% |

Data in the field is compared with the EMAP standard and processed into a table, then the intensity of insect and disease attacks is calculated with the equation (1), (2), and (3).

$$\text{The intensity of overall attack} = \frac{number\ of\ observed\ sick\ seedling}{number\ of\ observed\ seedling} \text{ x } 100\% \quad (1)$$

$$\text{The intensity of insect attack} = \frac{number\ of\ seedling\ attacked\ by\ insect}{number\ of\ observed\ seedling} \text{ x } 100\% \quad (2)$$

$$\text{The intensity of disease attack} = \frac{number\ of\ seedling\ infected\ by\ disease}{number\ of\ observed\ seedling} \text{ x } 100\% \quad (3)$$

## 3. Result and discussion

According to the Regulation of the Minister of Forestry Number P.03/MENHUT-V/2004 concerning Guidelines for the Implementation of the National Movement for Forest and Land Rehabilitation, the characteristics of healthy seedlings are: have good growth, have straight stems, has a dense crown, and not attacked by insects and diseases. The criteria for a healthy plant are that there is no symptom attack on the leaves and the width of the attack is very small compared to the total number of leaves [5]. Based on the results obtained from the health assessment of *S. javanica* seedlings in the nursery, the damage that occurred is presented in table 6.

The data in table 6 shows that the highest cause of damage to the health of *S. javanica* seedlings in the Way Seputih Way Sekampung Watershed Management Center and Protected Forest nursery was caused by the insect. Leaves are the most affected part of the plant. Insect attacks caused damage to the leaves by 40% of the total seedlings observed. The most common level of severity of the damage is in the 30%-39% interval. Insects are organisms that interfere with plants, damage plants and cause economic losses, reduce the production of a plant, and can also cause plant death [6]. Based on the observations, the insect that attacks *S. javanica* seedlings in the nursery are grasshoppers (*Valanga nigricornis*).

The part of the plant that is damaged by the grasshopper's attack is the leaf. Grasshopper attacks are characterized by the presence of bite marks with chewing type on the affected leaves. Grasshoppers do not eat all parts of the leaf but only part of the leaf surface. The grasshopper's attack results in a reduced leaf surface area, which can cause the photosynthesis process to be hampered. Plants growth becomes hampered if the intensity of the attack is high enough [7]. Observational data showed that 41 seedlings (41%) of the 100 *S. javanica* seedlings were observed to be attacked by grasshoppers.

**Table 6.** Seedling damage rate of *S. javanica*.

| Code | Number of healthy seedlings | Rank | | | | |
|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 |
| Causes of damage | 25 | Insect 41 | Disease 32 | Dead 2 | - | - |
| Part of the damaged plant | 25 | Leaf 71 | Under trunk 2 | Shoot 2 | - | - |
| Type of damage | 25 | Damaged leaf 40 | Discoloration of foliage 31 | Fracture and dead 2 | Dead shoot 2 | - |
| Level of severity | 25 | 20-29% 15 | 30-39% 20 | 40-49% 13 | 50-59% 9 | 60-69% 4 |

The second highest cause of damage to *S. javanica* seedlings apart from insects was disease attack (table 7). The symptom found attacking *S. javanica* seedlings was yellowing of the leaves. From the total of 100 damar seedlings observed, 32 seedlings (32%) were affected by the symptom. The change in leaf color from bright green to yellow, dim green, or pale green is called chlorosis [8]. Chlorosis is caused by the breakdown of chlorophyll or non-functioning chlorophyll. Discoloration of foliage can be caused by fungi or other pathogens or suboptimal environments. Based on the observation, the yellowing of the *S. javanica* leaves was probably caused by a suboptimal environment. Seedling leaves were observed to have characters: the old-growth was yellow and witted, and the new growth was light green. From the characteristic of the leaves, the disease attack on *S. javanica* seedlings was due to abiotic factors caused probably by nitrogen (N) nutrient deficiency [9].

**Table 7.** Data from the cause of damage to the seedling of *S. javanica*.

| Cause of damage | Code | Number of attacked (seedling) | % |
|---|---|---|---|
| Dead | 1 | 2 | 2 |
| Insect | 100 | 41 | 41 |
| Disease | 200 | 32 | 32 |
| Weather | 500 | - | 0 |
| Plant competition | 600 | - | 0 |

Based on table 8, the dominant types of damage encountered were damaged leaves and leaf discoloration caused by abiotic diseases and insect attacks. The percentage of damaged leaves for *S. javanica* seedlings was 40%, while the percentage of leaf discoloration for *S. javanica* seedlings was 31%. There is also a type of dead shoot damage with a percentage of 2%. Dead shoot disease can attack woody plants and shrubs. Shoot death disease in seedlings can cause severe problems because, in addition to causing damage at various levels of seedling age, this disease also has the potential to cause death in seedlings with a percentage of 5-15% [10].

**Table 8.** Result data of the type of damage to *S. javanica* seedling.

| Type of damage | Code | Number of attacked (seedling) | % |
|---|---|---|---|
| Trunk or Root Fractures | 11 | - | 0 |
| Dead Shoot | 21 | 2 | 2 |
| Fracture And Dead | 22 | 2 | 2 |
| Damaged Leaf | 24 | 40 | 40 |
| Leaf Discoloration | 25 | 31 | 31 |

**Table 9.** Part of damaged *S. javanica* seedling.

| Part of damaged | Code | Number of attacked (seedling) | % |
|---|---|---|---|
| Under Trunk | 4 | 2 | 2 |
| Top Trunk | 5 | 0 | 0 |
| Shoot | 7 | 2 | 2 |
| Leaf | 8 | 72 | 72 |

The data on the damaged parts of *S. javanica* seedlings are presented in table 9. Damage to the shoots and under the trunk of *S. javanica* seedlings has the same percentage, which is 2%. The most dominant amount of damage was on the leaves, which was 72%. This is in accordance with the statement of Sumardi and Widyastuti [11], which revealed that, in general, the parts of all seedlings are food favored by various insects because the parts are still young and soft. After the type and cause of the damage are known, it is necessary to observe the level of severity.

The level of severity of the damage was determined by calculating the ratio of the damaged part to the whole seedling. The highest level of severity interval of *S. javanica* seedlings is at 30%-39%. Although based on observations, the level of severity interval of insect and disease attacks on seedlings in the South Lampung Permanent Nursery is still relatively low; it is still necessary to control and eradicate insects and diseases that attack seedlings so that the development and spread of insect and diseases that have attacked can be controlled. The level of severity data of *S. javanica* seedling can be seen in figure 1.

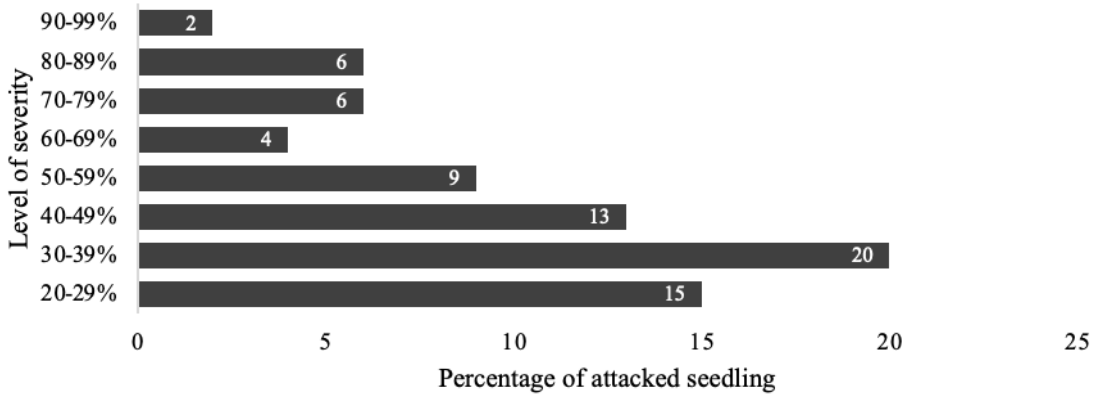


**Figure 1.** Level of severity data of *S. javanica* seedling.

Control that can be done is by physical and mechanical methods. Physical methods can be done by cleaning weeds, garbage, dirt in the nursery area, and weeds that grow in polybag media; weeds that allow insects to be sheltered must be destroyed by collecting them in a certain place or making compost. The mechanical method is to catch and destroy the insect locust [12]. The data from the research in a recapitulation of the health condition of *S. javanica* seedlings can be seen in figure 2. Based on the identification, from 100 *S. javanica* seedlings, 75% are identified as unhealthy seedlings, and 25% are identified as healthy seedlings.

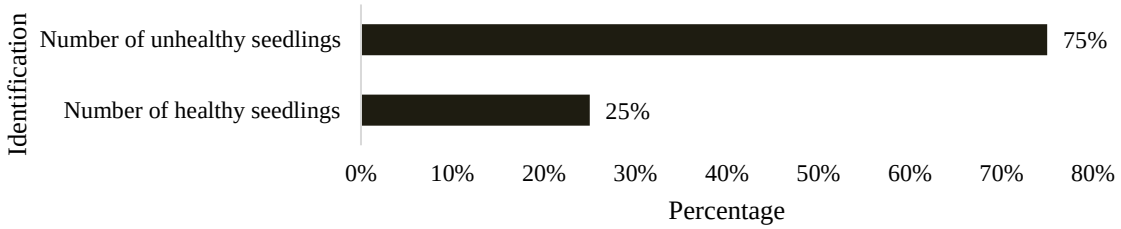


**Figure 2.** Recapitulation of health condition on *S. javanica* seedling.

**Tabel 10.** Life percentage calculation of *S. javanica* seedlings.

| Type of Seedling | Number of seedlings that are studied | Number of living seedlings | Life Percentage (%) |
|---|---|---|---|
| *S. javanica* | 100 | 98 | 98 |

Based on calculations, the life percentage of *S. javanica* seedlings in the nursery was 98%. Sindusuwarsono [13] stated that if the life percentage ranged from 91%-100%, it was categorized as very good; 76%-90% good; 55%-57% is classified as moderate, and <55% is not good. Based on this classification, the life percentage of *S. javanica* seedlings in the nursery is classified as very good.

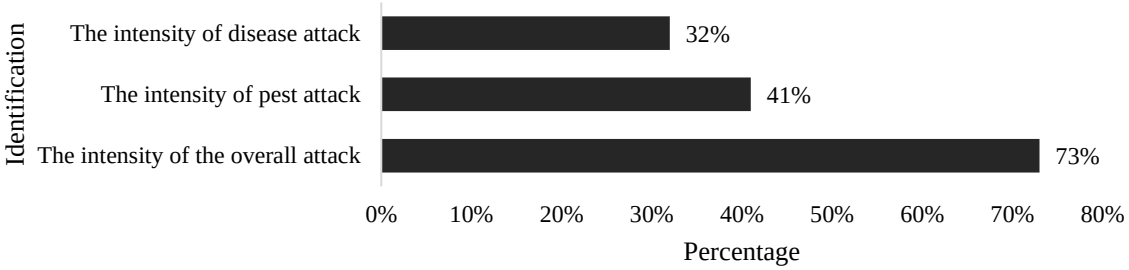


**Figure 3.** The intensity of attack (IS) of *S. javanica* seedling.

Figure 3 shows the intensity of the overall attack of *S. javanica* seedlings is at 73%. The intensity of insect attack on *S. javanica* seedlings is 41%, while the intensity of disease attack is 32%. This shows that insect attacks are more dominant than disease attacks, so efforts are needed to control insects and diseases at the nursery level. In addition, the cleaning of weeds must be regularly carried out so there is no competition for nutrients with seeds developed in the nursery [14]. This is necessary to prevent further damage to the two types of seedlings that are still healthy in the nursery. Physical and chemical control must be routinely carried out to eradicate potential attacks as pests.

## 4. Conclusion

Based on the identification from 100 *S. javanica* seedlings observed, 75% were identified as unhealthy, and 25% were identified as healthy. Among 75% of unhealthy seedling, 2% was dead. Leaves were the most affected part of the plant. Insect attacks caused damage to the leaves by 40% of the total seedlings observed. The overall attack of *S. javanica* seedlings was at 73%. The intensity of insect attack was 41%, while the intensity of disease attack was 32%.

## 5. References

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