Evaluation of five seeds of medicinal plants in the nursery level

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Abstract: Five plants i.e. Kemuning (Murrayapaniculata (L.) Jack), Temurui (Murrayakoenigii (L.) Spreng), Kuntobimo (Kigeliaafricana (Lam.) Benth. Syn. K. pinnata (Jacq.) DC.), Sala (CouroupitaguanensisAubl), and Salam (Syzygiumpolyanthum (Wight) Walp.) are regarded as types of plants that have the potential to be developed as raw materials for herbal medicine. Those five plants were planted in the species trial as well as ex-situ conservation plots in the Grand Forest Park Bunder, Gunungkidul at the end of 2018. This study aimsto find out more about research status of these plant types by literature review method, e.g. from books, proceedings, both print and online journals, and conducting seed evaluation in the Yogyakarta Center for Forest Biotechnology and Tree Improvement. Seed evaluation method in the nursery was conducted by measuring diameter, height and sturdiness of as many as 36 seedlings for each plant. The seed evaluation in the nursery showed the average diameter of 4.93 mm, theaverage height of 31.66 cm, and the average seedling sturdiness of 6.63. The evaluation results also show that the best seeds ready for field test planting in order are Sala, Salam, and Kemuning. As for Temurui and Kuntobimo seedlings, due to their limited height, an intensive maintenance is needed, especially fertilization, so that at the end of the year theywould also beready for field planting.

1. Introduction

The World Health Organization has recommended the use of drinks or herbal medicines in health care, prevention, and treatment of diseases, especially in chronic and degenerative diseases [1]. WHO provides support in an effort to improve the safety and efficacy of traditional medicines. Traditional medicines that have relatively lower side effects are believed to be safer compared to consuming modern medicine. The use of natural materials is more acceptable to the human body than synthetic materials [2]. Communities are more likely to return to natural things along with the entry of products from natural ingredients both from within and outside the country.

It is stated that forest management is basically ecosystem management [3]. The change in the paradigm of analyzed forest management into ecosystems is based on placing Non-Timber Forest Products (NTFPs) as superior forest products in the forestry industry. NTFPs definition according to Minister of Forestry Regulation (Permenhut) No. P.35 / Menhut-II/2017 are the results of both vegetable and animal forest products along with derivative products and cultivation except wood originating from the forest[4]. In the Minister of Forestry Regulation, 565 types of NTFPs consisting of 490 species of flora and 75 species of fauna have been identified.
Indonesia's natural wealth includes various types of plants that have the potential as raw materials for traditional medicines for various diseases, which reaches number of around 30,000 [5]. This was confirmed by the report of the Food and Drug Administration in 2007 stating Indonesia was the second largest country in the wealth of biodiversity after Brazil. Indonesia's wealth is in the form of medicinal raw materials from around 30,000 types of plants and around 1,000 species have been used as raw material for medicines. There are about 31 types of medicinal plants originating from the forest as raw material for traditional medicine (herbal medicine) industry, non-herbal industry, and seasoning for export needs of more than 1000 tons/year [6].

Based on the above problems, it is necessary to attempt to save the types of medicinal plants in conservation activities both in-situ and ex-situ[7]. Some construction activities of ex-situ conservation plots includes the activity of determining target species, finding information about the location of natural distribution and fruiting time, collecting genetic material both vegetative and generative, making and maintaining nurseries, determining the location of ex-situ conservation plots whose environment is in accordance with its natural habitat, planting and maintenance in the field. This study aims to determine the research status of medicinal plant species.

2. Materials And Methods

This study was conducted at CBTI Office in Yogyakarta in February-September 2018. The method of study was done through review of various sources such as books, proceedings, and journals both printed and online in several libraries. The evaluation or measurement of several medicinal plants in the CBTI Yogyakarta nursery was carried out in May 2018 with diameter, height and robustness of seeds as parameters assessed. Measuring the height of the seedlings was carried out from the base of the stem to the top of shoot. Diameter was measured at the base of the stem. The robustness value of the seed was calculated by comparing the height of the seed (cm) with the stem diameter (mm). The number of seedlings measured of each species is 36 seeds which are genetic material in the construction of ex-situ conservation plots.

3. Results And Discussions

3.1. Kemuning (Murrayapaniculata (L.) Jack)

Kemuning (Murrayapaniculata (L.) Jack) has other names namely kamuning, kamuniang, yellow, kemuning, kemiuning or gading wood[8]. Kemuning is a tropical plant that can reach 2-4 meters high and flower all year round. Kemuning is also one of the plants planted in the courtyard of the Gadang House in Minangkabau, revealed in the Pasambahan Rumah Gadang Speech that kamuning for kudo links means yellow for horse links. The spread of yellow includes Sri Lanka, India, Myanmar, Indo-China and often also cultivated in the area of New Caledonia. It was found that leaves like orange leaves are only smaller in size, often used as ornamental plants or hedgerowflowers of a terminal type and fragrant, petals have a length of about 12-18 mm and are white [9]. The fruits will be red to orange if they are already ripe. Traditionally Filipino and Indonesian communities use kemuning leaves to treat diarrhea and dysentery[10].

According to research, this plant has the ability as an analgesic, anti-inflammatory, and able to treat tooth pain. As for other studies the kemuning plant has the potential as a diabetes drug because it has a glucose-lowering effect [11]. Besides being used in the health sector, the Minangkabau people traditionally use yellow roots as knife stalks or ladiang (machetes). Yellow veins have good colors and the wood is clay, so it doesn't break easily if used. Yellow wood can also be used for abacus, brush stalks and also as sticks.

3.2. Temurui (Murrayakoenigii (L.) Spreng)
Murrayakoénigii with another name temurui is a small tree-bearing plant that grows as high as 4-6 m (13-20 feet) with a stem diameter of up to 40 cm (16 in) [12]. Pinnate leaf shape, with 11–21 leaves each branch. The leaves of this plant have a length of 2-4 cm (0.79-1.57 inches) and width of 1-2 cm (0.39-0.79 inches). Murrayakoénigii has small white flowers that can pollinate themselves to produce small, shiny black fruits that contain large single seeds[13]. Although the fruit can be eaten with a sweet taste like medicine in general, both pulp and seeds are not used for culinary purposes[8]. Temurui is native to Sri Lanka, India, Myanmar, Indo-China, southern China and Hainan and is often cultivated in Malaysia, Java, and Borneo. It is stated that the leaves of this plant are commonly used as a spice in South and West-coast India, as well as in cuisine in the country of Sri Lanka [13]. Murrayakoénigii leaves are also used as herbs in Ayurvedic medicine where the leaves of this plant have anti-diabetic properties, reduce cholesterol, and anti-diarrhea.

3.3. Kuntobimo (Kigelia africana (Lam.) Benth. syn. K. pinnata (Jacq.) DC.)
This plant grows to about 10 m high[14]. The leaves are ovoid to oval and about 4-18 cm long. These plants bloom in spring or summer, crowns and petals fused to form flower tents shaped like irregular bells 9-13 cm long and yellowish outside and purple inside. The fruit is hard and long with a size of 30-50 cm which depends on the stalk for several months but is not easily broken. Its natural distribution includes South, Central and Western Africa. This plant is used as traditional medicine to treat various kinds of skin diseases such as fungal infections, boils, psoriasis and eczema and can be applied internally to dysentery, ringworm, tapeworm, postpartum hemorrhage, malaria, diabetes, pneumonia and toothache [15].

3.4. Sala (Couroupitaguaianensis Aubl)
This plant has pink flowers, and large gold with stamens in the middle which is unusual and has a sharp aroma. Couroupitaguaianensis is a truly beautiful tree, not by growing branches that reach out from straight stems, striking flowers, with 3" to 5" growing directly on the skin. Its spread in South America is tropical (especially Guyana and Suriname). This tree also produces orbicular brown wood. Double-fleshed fruit with a large enough size. The fruit consists of small seeds in very white fruit flesh that smells bad. The size of ripe fruit is 24 cm in diameter, the weight of ripe fruit is around 1450 grams, and the weight of the shell or fruit peel is about 545 grams. This plant is listed as a rare tree and flower in the Republic of India. The leaves of Couroupitaguaianensis are traditionally used as antiseptics and odontalgia. Juice made from leaves is used to cure skin diseases, and in South America, tree components are even used to treat protozoan infections. Historically, the leaves of this plant were used in the treatment of skin diseases, abdominal pain, and enteral gas formation, antithrombotic action and vasodilation.

3.5. Salam (Syzygium polyanthum (Wight) Walp.)
Salam is a large tree that can reach a height of 20-25 meters. Brown rice leaves simplicia, weak aromatic odor, and keletan taste. Single stem with short stems, leaf stems 5-10 mm long. Elongated leaflets, 7-15 cm long, 5-10 cm wide, tapered leaves and base. Bay leaf is one of the species tested until the clinical trial stage in an effort to get a phytopharmac drug. Bay leaves contain secondary metabolites which have many pharmacological activities in dealing with various diseases. It spreads on the island of Java, greetings thrive on lowland land up to an altitude of 1400 meters above sea level. Bay leaves have a variety of pharmacological activities in overcoming antihypertension, antidiabetic, antioxidant, anti-diarrheal, anti-inflammatory, immunomodulatory, antibacterial, and anticancer. Active compounds that are generally responsible for pharmacological activity are quercetin, gallic acid, caffeic acid, and phenolic acid. Pharmacological activities occur with various work mechanisms in dealing with various diseases.
One effort to save endangered species is by conducting conservation activities both in-situ(in their natural habitat and ex-situ(outside their natural habitat). The types of priorities for conservation are those having a key role in an ecosystem or economically prospective to be developed in the community [16]. The CBTI Yogyakarta researchers from 2008 to 2017 have collected rare plant species, reproduced and disseminated to some parties who care about the preservation of rare species [17]. At the end of 2018, CBTI planned to collaborate with Local Government of Yogyakarta to build ex-situ conservation plots of several rare species including Pranajiwa with a species trial design in Bunder Forest Park, Gunungkidul. The purpose of this activity is to assess the growing ability of some rare species tested in Gunungkidul which has a dry climate. Before being tested with other rare species, an evaluation or measurement of several rare plant seeds was carried out, including Pranajiwa species in the CBTI nursery in May 2018 with parameters of diameter, height and robustness of seeds. Result of medicinal plant seedling evaluation can be seen in Table 1.

| Table 1. Growth of seedlings of medicinal plants in the nursery |
|----------------------------------------------------------------|
| Nu | Species name | Observation parameter |
|----|--------------|-----------------------|
|    |              | Diameter (mm) | High (cm) | Sturdiness |
| 1  | Sala (Couroupitaguanensis) | 6.41 | 46.72 | 7.33 |
| 2  | Salam (Syzygium polyanthum) | 4.21 | 35.69 | 8.64 |
| 3  | Kemuning (Murraya paniculata) | 4.80 | 35.92 | 7.49 |
| 4  | Kuntobimo (Kigelia africana) | 5.39 | 12.42 | 2.35 |
| 5  | Temurui (Murraya koenigii) | 3.83 | 27.53 | 7.36 |
| Average | | 4.93 | 31.66 | 6.63 |

| Table 2. Seed quality criteria |
|--------------------------------|
| Nu | Assessment criteria | Seed quality |
|----|----------------------|--------------|
|    |                      | 1  | 2  | 3  |
| 1  | High (cm)            | 50 - 65 | 35 - 49 | < 35 |
| 2  | Diameter (mm)        | 5.0 - 8.0 | 4.0 - 4.9 | < 4.0 |
| 3  | Sturdiness           | 6.3 - 10.8 | 10.8 - 12.0 | - |

Source: [18]

The results of seedling measurement in the nursery (Table 1) show an average diameter of 4.93 mm, an average height of 31.66 cm, and the average robustness of seeds 6.63. Referring to Indonesian National Standardization (SNI 01-5005.1-1999) as written in Table 2 and [18], it is shown that the quality of seedlings consists of 3 categories. Based on the average of the three parameters measured, in general the five plant species are categorized in second seed quality based on diameter, the third seed quality based on height, and the first seed quality based on their sturdiness.
If we look at the data for each species based on 3 parameters (Table 2), the seeds that are ready for planting in the field by best order are: Sala, Salam, and Kemuning. For Temurui and Kuntobimo, intensive maintenance is needed in order to accelerate their height, so they could be ready to be planted in the field. It is mentioned that shoot height correlates with the number of leaves and can provide estimate of photosynthetic capacity and transpiration area [19] and higher seeds have a competitive advantage with weeds and can indicate superior genetic traits [20]. Plant height is an indicator of growth and can be a parameter used to measure environmental or treatment influences because it is sensitive to environmental factors. It is also stated that the diameter is interpreted as the best estimator of the life percentage and growth of seedlings in the field [19]. Larger diameter indicates a large root system and stem volume. According to [21], the bigger the stem diameter, the greater the fruit production. This is probably because in the wider diameter, xylem as the organ to transport nutrients and water from the soil becomes larger, so that more nutrients and water are transported.

4. Conclusion

The research status of the five species studied, namely Kemuning, Temurui, Kuntobimo, Sala, and Salam is still very limited. The evaluation results of the five seedlings in the nursery showed the average diameter, height and robustness are 4.93 mm, 31.66 cm, and 6.63, respectively. Some seeds that are ready for field planting based on the best order are Sala, Salam, and Kemuning. Meanwhile for Temurui and Kuntobimo, due to their limited height, intensive maintenance measures are needed, especially fertilization, so that at the end of the year they could be ready to plant in the field.

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