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Character education development through bioprospecting of medicinal plants in Indonesian national park

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Abstract

The aim of the study is to investigate health behavior and character education development through bioprospecting of medicinal plants of citizen from Bromo Tengger Semeru National Park. The medicinal plants were determined by exploration methods in 6 sub-districts at there. Then, health behavior of citizens was determined by interviewing 20 respondents. The character building will solve the problems to save forests. This educational method emphasizes not only build personal soft skills, but also to keep local wisdom. As a result, it was bioprospects to integrate the character education into the education curriculum at every level of education in East Java.

Keywords: Biodiversity, bioprospects, medicinal, plants, pharmaceutical.

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Desarrollo de la educación del carácter a través de la bioprospección de plantas medicinales en el parque nacional de Indonesia

Resumen

El objetivo del estudio es investigar el comportamiento de la salud y el desarrollo de la educación del carácter a través de la bioprospección de plantas medicinales de ciudadanos del Parque Nacional Bromo Tengger Semeru. Las plantas medicinales se determinaron mediante métodos de exploración en 6 subdistritos allí. Luego, el comportamiento de salud de los ciudadanos se determinó al entrevistar a 20 encuestados. La construcción del carácter resolverá los problemas para salvar los bosques. Este método educativo hace hincapié no solo en desarrollar habilidades personales, sino también en mantener la sabiduría local. Como resultado, fue bioprospectos integrar la educación del carácter en el plan de estudios de educación en todos los niveles de la educación en Java Oriental.

Palabras clave: Biodiversidad, bioprospectivos, medicinales, plantas, farmacéutico.

1. INTRODUCTION

Medicinal plants are plants that have medicinal properties that can be used for health care. Indonesia is a mega biodiversity with a wealth of flora that belongs to more than 30,000 species of plants, which is representing the largest number of the world's plant population that consist about 40,000 species. In other words, the amount of those plants which is located in Indonesia is 75% of the amount of plants of all over the world. Among the 75% number that exist in Indonesia, 940 species are medicinal plants and they represent

90% of the amount of medicinal plants in Asia (Gunawan & Mukhlisi, 2014). About 20-22% medicinal plants are cultivated and about 78% of medicinal plants are obtained from the forest. According to WHO, 80% of the world's human population depends on herbal medicine. Based on Indonesian Health Minister Policy on 2013, 25% of modern medicine in the global market is derived from plants. The needs of medicinal plants as raw material for herbal medicines as well as raw material for other health products make the medicinal plants have a good bioprospect to be developed in the community, which provides long-term benefits and also has an impact on the preservation and development of local wisdom.

There are 50 national parks in Indonesia 16.38 million hectares area, which have high diversity medicinal plant species. There are 127 species medicinal plants in Kutai National Park (Limberg et al., 2009), 36 species from Beratus Mountarea conservation site and has been used as a traditional medicinal plant by the Dayak tribe of the Benuaq from the west side of Kutai (Falah et al., 2013). On another side, Barata et al. (2016) found 58 species of 38 medicinal plants families in the Dieng plateau. The plants that have been found by some researchers indicate that Indonesia is rich of medicinal plants. Therefore, it has potential as a raw material for medicine as described in Indonesian Health Minister Policy (Permenkes) 88/2013, since that the production of drugs derived from common medicinal plants was inadequate for world demand.

The bioprospect development of medicinal plants generally could provide many benefits for the Indonesian people and particularly of local communities. Gunawan and Mukhlisi (2014) reported a profit development of bioprospect by exploiting natural resources and local wisdom could improve the local community economy, provides benefits for biodiversity conservation, and improve the quality of social life. Then it could be used as an object or a tool for development of character education in the society.

The character education includes educational value, manners, morals, deeds, and ethics (Anwar, 2016). It is important to be implemented to build Indonesian society's mindset to become resilient to face the global challenges. According to the Ministry of National Education (2010), character education has several functions, i.e.: organize and develop, recovering and establishing, and filtering individual potency. Character education can be developed in various aspects of life, including the health aspect. According to Ministry of Health statistics in 2013, the problem of malnutrition and poor nutrition were successively increased to 2% and 0.6% from 2010. The burden of disease in Indonesia, according to statistics of the Ministry of Health in 2010, the type of injury increased to 1%, non-contagion diseases increased to 9%, and infectious diseases decreased to 10%.The non-contagion diseases, such as diabetes increased to 86 %, stroke increased to 76%, heart disease increased to 85%, and depression increased to 33%.

In order to repress those burden disease issues and increased the health rate, Indonesian government made the health program to express the ideas of the importance to be realized by all Indonesian citizens called "Indonesia Sehat". Those ideas described the goals of Indonesian people in order to become an environmental-educated society and living in healthy behaviors and environment. The indicator of the success of the program is public awareness of the importance about healthy living values which was manifested in proactive behaviors to maintain and improve the health, prevent the risk of disease, and takes part in the organization of public health movement actively.

Indonesian society has a very important role as a successor of the "Indonesia Sehat", because the strong willingness of the society to have healthy living behavior will increase the success of the program. Therefore, the success or failure of the program would determine the character of the society. The healthy living character of society will determine the extent of society committed to having the healthy behaviors, in accordance with the principles of health physically, spiritually, and socially. The character education is important to build society mindset and commitment to have healthy living behaviors (Boddington et al., 2014). Based on research by Permata (2015) and Nurjannah (2015), Indonesian people have not fully exploited Indonesian common natural medicinal herb plants yet. About 40% they preferred to use chemical drugs for medicinal purpose. This indicates that there is a lack of awareness of the Indonesian people to develop

the potential of local knowledge about health, medicinal plants, and stuff.

The basic aspects of life, such as education, health, and the economy are the interrelated and inseparable elements. However, education was considered as the fundamental thing to develop all those aspects by gaining the good society character and public awareness. Brunckhorst (2013) mentioned that natural resources and local wisdom can be utilized to solve the problems of the society. Therefore, Indonesian character education can be built through environmental science approaches. Lee et al., (2013) proposed a character education based on conservation, which is a purpose of boosting the character values of Indonesian society. The good intentions of nurturing, preserving, maintaining, and developing the physical, social environment, and cultural values are important to achieve the balance life of the human and surrounded environment. Additionally, character education of the society can be developed through utilization and conservation. Therefore, medicinal plants as one of the beneficial environmental resources in Indonesia have a good bioprospect to be developed in order to build the society character. It is important because character development of Indonesian society can provide a long-term sustainable and beneficial effect, which has an impact on increasing the level of economic and social welfare of inter-Indonesian society.

Based on the above statements, the constructive systemic, holistic and dynamic efforts are needed through an educational

approach. Education has a most important position in the front of the formation of society character and public awareness of the values of healthy living. Educational activities need to be directed to support and reinforcement process. Education has a role not only in the transferring of knowledge, but through cultivation (enculturation) in various domains, which is oriented towards the formation of character (Zeidler et al., 2013). That will allow people to get used to behaving based on values of healthy living which had been internalized in a person's psychology as a character.

2. METHOD

This research conducted from May to August 2015 in 6 regions in the area of Bromo Tengger Semeru National Park, Malang, East Java, Indonesia. The regions were: Ngadas, Argosuko, Tumpang, Turen, Wagir, and Bantur. The amount and species of medicinal plants in the study area were determined by exploration method. Each region had samples that could be used as a comparison with other regions since it was intended to collect the data of the plant types from every region (Suwardi, 2013).

Health behavior of citizens was determined by interviewing 20 respondents for each 6 regions of 5 sub-districts. The information from the questionnaire was applied to obtain adequate data and in accordance with the focus and purposes of the research.

The data was collected step by step. In the first step, it was an assessment to the location in order to obtain a general overview of the objective conditions of the research. The next step was exploring by collected the data more deeply and directly along with a focus of research and tried to find the sources of the data or knowledgeable informants about the problems that had been studied. The data was collected not only by direct exploration using Canon 450D SLR camera but also questionnaires and interviews. The various types of surrounded environment in each region were also used documented as the addition of primary data that was collected.

The primary data of this research included: 1) the number and species of medicinal plants of 6 regions, 2) public awareness of the medicinal plants advantages, and 3) the economic, social, and educational benefits of medicinal plants. The data were analyzed using descriptive analysis, except the amount and species of medicinal plants data. The amount and species of medicinal plants were analyzed by describing the character of each species and grouped them by expediency as a medicinal plant based on plant taxonomy book (Muller-Wille & Charmantier, 2012) and medicinal plants books in order to determine their species diversity, kingdom, and family.

3. RESULTS

There were 214 plant species from 70 families were identified in the 6 areas in the district of Malang, 34 species were found in the enclave area and 180 species were found in the of the non-enclave area (Table 1).

Table 1. The number of medicinal plant in 6 area in the district of Malang

Regions	Group	Total Species Magnoliopsida	Family	Order	Dominate Family	Bioprospecting
Ngadas	Herba	27	18	17	Solanaceae	Vegetable Crops and Medicinal Plant
Poncokusumo	Lignosus	7	6	6		
Argosuko	Herba	45	35	34	Euporbiace	Traditional Herbs
Poncokusumo	Lignosus	48	26	26		
Wagir	Herba	19	15	14	Zingiberaceae	Healthy Drink Product and Traditional Herbs Tonic
	Lignosus	10	7	7		
Tumpang	Herba	45	25	18	Zingiberaceae	Healthy Drink Product and Traditional Herbs Tonic
	Lignosus	36	21	21		
Turen	Herba	58	32	25	Zingiberaceae	Healthy Drink Product and Traditional Herbs Tonic
	Lignosus	58	35	29		
Bantur	Herba	50	28	23	Zingiberaceae	Healthy Drink Product and Traditional Herbs Tonic
	Lignosus	47	29	27		

Turen had the richest diversity of medicinal plants as much 116 species of 47 families. Contrary, Wagir had the lowest diversity of medicinal plants as much 29 species of 22 families. The four other

areas respectively, Bantur (97 species of 42 families), Argosuko (93 species of 45 families), mixed samples areas (81 species of 40 families), and Ngadas (34 species of 19 families). Among the medicinal plants which had been discovered from 6 regions, Zingiberaceae family was dominated Wagir, Tumpang, Turen, and Bantur regions. The other medicinal plants family, Euphorbiaceae, and Solanaceae were dominated Ngadas and Argosuko regions.

4. DISCUSSION

The diversity level of medicinal plants in those regions had a potential bioprospect that needs to be developed. From the observations, the medicinal plants were found as many as 214 species. It had potential as a raw material for pharmaceuticals products and cooking ingredients and beverages. In addition, it could be used as health purpose to treat diseases that commonly suffered by local society, i.e.: fennel (Foeniclum vulgare) used to cure a cough, fever, and abdominal constipation; binahong leaves (Anredera cordifolia) used to cure wounds and inflammation; Cumin sputum (Curcuma xanthorrizha) used for relieving body seizures; kencur (Curcuma zedoaria) used to cure skin disease and cough; kitolod flower (Isotoma longiflora) used to eyes strain; daun pecut kuda (Stachytarpheta jamaicensis) used to cure diarrhea, nosebleeds, and cough; galangal (Alpinia galanga) used as tinea versicolor antidote; lemongrass (Cymbopogon citratus) used to cure fever and coughs; betel (Piper betle) used cure bleeding gums and nosebleeds; daun tapak liman

(Elephantopus scaber) used to cure malaria, fever, and dysentery; temu giring (Curcuma heyneana) used to cure intestinal worms and skin diseases (Wachtel-Galor and Benzie, 2011); and many other medicinal plants species that could be used to treat and cure disease.

Medicinal plants also have economic prospects as a raw material of medicine product. Minister Regulation no.88 2013 stated that traditional medicine utilization in Indonesia had increased from year to year, which in 1980 recorded as 19.9%, 1986 increased to 23.3%, 2001 increased to 31.7%, and increased steadily in 2004 to 32.8%. The global requirement of drug substance is an opportunity for the local society of 6 regions above to develop the production of their natural medicinal plants. The medicinal plants that have been used as an export commodity among others are: tapak dara (Catharanthus roseus), kecubung (Datura metel), ginger (Zingiber officinale), pule pandak (Rauvolfia serpentina). Those species are often found in those 6 regions, so it could be developed as the raw material medicine production. According to Barata et al., (2016), with the development of medicinal plants commodity, is expected to improve and sustain the preservation of the diversity of species of medicinal plants.

Medicinal plants not only used as raw material for medicine, but also could be used for the production of healthy beverages, such as instant powder of traditional herbal medicine. For example, herbal drinks or traditional herbal tonic could be produced from turmeric, kencur, ginger, temu giring, and cardamom (Zingiberaceae). Since there were many plants species dominated the regions belonged to the

Zingiberaceae family (Table 1), so the utilizing and development of those medicinal plants by the local society would be very high. Medicinal plants as one of the natural local wisdom that had very good potential to give benefits and improve the economic, social, and education of the society.

However, the utilization of medicinal plants of the 6 regions above was still had not optimal yet, it showed that only 26.75 % of Bantur citizens were utilized the medicinal plants. It meant that the existence of medicinal plants in the region have not been fully developed yet since the medicinal plants potential of the Bantur that had been discovered was 97 species. The lack of medicinal plants utilization by Bantur citizens could be caused by several things: 1) not sufficient education/knowledge about medicinal plants, 2) the society preferred chemical/synthetic medicine than herbal medicine, 3) the ease service of medical health centers, 4) the lack the knowledge and skills of the utilizing medicinal plants, 5) the individual's characters that have different tends to the conservation of medicinal plants.

The condition in Bantur was different from Ngadas, the percentage of Ngadas society who used medicinal plants was 74.4%. But actually, Ngadas was included into a region that has low medicinal plants diversity as much 34 species only. The medicinal plants species that were found in Ngadas belonged to the Solanaceae family, such as tomato, eggplant, peppers, and potatoes. The abundant plant production in Ngadas, makes that region had potential not only as a center of vegetable production, but also as a medicinal plant that has

been used for daily living by generations. Tengger Tribe, the native inhabitant of Ngadas, were relied more on natural sources of the plant for various purposes and have a fairly good knowledge about the diversity of plants in their neighborhood (Batoro et al., 2011). Character education of the local society has been taught for generations to exercise the prudence of the natural products utilization. In addition, Ngadas is located nearly to the tourist site of Bromo Tengger Semeru National Park that makes a good opportunity to develop bioprospect of medicinal plants as a local commodity for the visitors.

Argosuko citizens had not optimized the medicinal plants yet since only 34.5 % citizens have been using medicinal plants compared with the availability 93 species of medicinal plants. Moreover, if there is any exploitation, only the sporadic one of the community would have participated in various training initiatives of various events.

Contrary, Tumpang citizens had more awareness than Argosuko since 47.29 % citizens were had been utilized the medicinal plants, which the diversity was discovered as much 81 species in this research. The diversity of medicinal plant species in the Tumpang region was less than in Argosuko (Table 1). Based on the interview, it could be inferred that these differences were occurred because of some reasons: 1) Tumpang citizens had better awareness about education than Argosuko, 2) the local government program (citizens was ordered to plant medicinal plants in the backyard/polybags) had run well, and 3) there was a good response from the society to the local government program about the benefits of medicinal plants.

Turen had an equal percentage between the medicinal plants utilization and its potential resources, it was proven by 58.67 % citizens had utilized the medicinal plants compared with high biodiversity of the medicinal plant as much 116 species. It had the different condition to Ngadas and Bantur because the two regions had a contradictory condition between medicinal plants utilization and medicinal plants diversity.

Utilization of medicinal plants in Wagir was about 61.78% with 29 medicinal plants species that had been discovered. Wagir and Ngadas region had better utilization of medicinal plants, but the availability of medicinal plants as raw materials for the production was still lack. The questionnaire results showed that citizens who have made use of medicinal plants have not been utilizing medicinal plants as raw material for commercial production of herbal medicine and other health products.

Medicinal plants not only be a beneficial commodity of the economy, but also be used to increase the societal character. Processing the medicinal plants requires people to have a creative attitude, tenacious, diligent, and disciplined character. The character's development was aimed in order to the society could be expected to have a good character and awareness of healthy life. According to Permata (2015) through the utilization of Indonesian medicinal plants could develop healthy life character such as responsibility, healthy lifestyle awareness, disciplined, logical thinking, creative, and innovative. It could increase the awareness of the social rights and

environmental care. Furthermore, character education and awareness of healthy life could also be grown through the preservation of medicinal plants, planting, and maintenance.

Through this bioprospects research, it was expected to provide benefits to the society, both short and long-term benefits. The short-term bioprospects benefits of medicinal plants were able to increase the awareness of the society to preserve the diversity of medicinal plants. The awareness of the natural local wisdom for the prosperity of the society, as it would follow by discipline, innovative and creative character. The long-term bioprospects benefits of medicinal plants where it could develop into an export commodity that had high economic value, followed by increasing awareness and education, promoting the social status of the 6 regions.

The conclude of the research are many as 214 species of medicinal plants were successfully discovered in 6 regions of five districts in Bromo Tengger Semeru National Park, Malang. Based on public awareness of medicinal plants utilization, there was a gap between the potential of medicinal plants with the local society utilization of the medicinal plants.

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