

**TRADITIONAL TO RATIONAL AND MODERN PHYTOPHARMACA  
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**ABSTRACT**

The use of traditional/herbal medicine in both developing and developed countries tends to increase. This tendency has two significant dimensions: a. medical aspect dimension related to its widely use in global world, and b. economic aspect dimension related to the creation of added-value in economy for human being. WHO has underlined that framework for joint actions between WHO and country members is very important aiming at more significant roles of herbal medicine in health care system.

Indonesian herbal medicines, called JAMU, have been widely used by Indonesian to maintain their health and to cure the diseases since many centuries ago. In the future, the development and the use of Indonesian herbal medicines must be based on the stronger scientific evidence, especially through scientific research and standardization, so they can be integrated into national health care system. Jamu, has been declared as Indonesian brand by Susilo Bambang Yudhoyono, President of the Republic of Indonesia on May 27, 2007 in Jakarta.

**Keywords:** Herbal medicine, medical aspect, economic aspect, standardization, national system of health care.

**a. INTRODUCTION**

The use of traditional medicines in Indonesia is part of national cultivation and has begun from centuries ago, however, the effectiveness and safety has not yet been supported by comprehensive research. Taking into account this fact and achieving that Indonesia is the mega-center of herbal medicines in the world, it is regarded necessary to establish policy for national traditional medicines enable as reference for all parties involved.

Natural resources of chemicals substance and traditional medicines preparations are national assets to be continuously explored, examined, developed and optimized of their benefits. As a nation possessing high bio-diversity and herbal natural resources represent assets with comparative value and the superior asset in the use and development for competitive commodity.

Indonesia possesses about 400 ethnics (ethnics and sub-ethnics). Each ethnic and sub-ethnic has wide knowledge inherited from generation to generation, traditional knowledge of medicines and medications. The evidence of use of traditional medicines in Indonesia from centuries ago are represented in the relief of *Prambanan* and *Borobudur* temple, written in *lontar leaf*, and the inheritance and cultivation in Kingdom Palaces to this date. Rural communities have long time ago consume *temulawak* (*Curcuma xanthorrhiza*) to maintain their physical fitness. Written information on herbal medicines kept in Surakarta Palace Library are "*Serat Kawruh*" and "*Serat Centhini*" (Ministry of Health, Republik of Indonesia, 2015).

The Indonesian government provides support for the development of herbal medicine to modern phytopharmaca. There are some considerations for the development of Indonesian herbal medicine :

- Greatly overflow of raw material
- Sufficient human resources (empirical use of traditional healer)
- Community beliefs: *Jamu* has mild or no side effects
- *Jamu* is relatively affordable be able to fulfill the need of 240 millions people of Indonesian citizens

- There have been several basic researches conducted by lecturers, but still limited to the academic purpose

Development of Indonesian traditional/herbal medicine through laboratory research and clinical research lead to phytopharmaca, will help the community in efforts to improve their health condition and economically profitable because the use of traditional medicine reduces the cost of treatment and the development of traditional medicine as a health product will increase the national income (Ministry of Trade, Republik of Indonesia, 2009).

This paper will discuss the development of traditional medicine / herbal Indonesia to phytopharmaca (modern) medicine and their role in improving public health and add national income.

#### **b. BIODIVERSITY**

Much study has been carried out in recent years on Indonesian medicinal plants by distinguished universities around the world. As described by Shibuya and Kitagawa (1996) from Fukuyama University, Hiroshima, Japan, "series of scientific expeditions have been conducted by Japan, in Indonesia for collecting information and materials relating to the pharmacochemical study of locally used medicinal plants and Javanese traditional medicine "jamu" since 1985." (Robin, et al, 2007).

Indonesia is widely known as Mega center biodiversity (Biodiversity) the second largest after Brazil in the world, which consists of tropical plants and Marine biota. In the Indonesian territory there are About 30,000 species of plants and 7,000 among them suspected of having efficacy as drug. The richness of this biodiversity need to be researched, developed and utilized to improve health and goal economy, while maintaining its sustainability (Sampurno, 2016).

The survey results of Biota Medica Expedition team in 1998 in Taman Bukit Tigapuluh National Park and Biosphere Reserve of Bukit Duabelas Hill located in Riau Province and Jambi known 45 ingredients with 195 species of medicinal plants have been used by tribal communities. Traditional Malay, 58 herbs with 115 species are used. The Talang Mamak tribe community and 72 kinds of herbs with 116 species by the tribe of Anak Dalam people. Borneo as a tropical rain forest keeps it at least 4,000 plant species that can be a source of findings new drugs. The people of Borneo are already very familiar with the drug traditional pasak bumi (*Eurycoma longifolia*) used for increase male sexual activity. Other known plants is the sea lobster (*Strychnos ignatii*) which is the steeping of the root skin used as a tonic and relieves fatigue.

Balinese people are very familiar with "Lengis Arak Nyuh" is multi-purpose oil of distillation product of various kinds of plants species consisting of remnants of spices and cuts coconut that is smoked over the kitchen stove for 4-5 months.

In 1977 a research team in Southeast Sulawesi found 449 species of medicinal plants still in use and dozens of potions a plant used by local residents as a medicine. In Bugis-Makassar ethnic groups are well known for their treatment and ways prevention of disease done by the written ancestors in the lontaraq pabbura script. Several types of plants that have been known to hereditary for treatment such as wood Sanrego (*Lunasia amara* Blanco), paliasa leaf (*Kleinhovia hospita* Linn) and santigi (*Phempis acidula*)

There are 216 types of medicinal plants used by South Maluku community. In Papua, the public exploits thousands of types of medicinal health care plants such as grasses Keybar to improve female fertility, akwai (*Drymis anthon*) for male sexual enhancement, and watu (*Piper methysticom*) as tranquilizer. (Keputusan Menteri Kesehatan Nomor : 381/Menkes/SK/III/2007)

Indonesia posses :

- 10% of world's flowering plant species
- 12% of world's mammal species
- 16% of world's reptile and amphibispecies
- 17% of world's birdspecies
- 25% of world's fishspecies
- 15% of world's insect species

Indonesia forest and marine content a huge of biodiversity:

- Almost 30.000 plant of herbal medicinal
- Apparent 7000 species known and have been used for medical purpose
- About 250 species used in traditional medicine, Jamu industries
- In 2003, total of 9737 item of herbal medicines has been registered, wich include 1093 item imported product

### **c. INDONESIAN STRATEGIC TRADITIONAL/HERBAL MEDICINE DEVELOPMENT**

The Indonesian republic government has issued several regulations related to traditional medicine, including:

- UU No. 36 Tahun 2009 about Health.
- Keputusan Menteri Kesehatan RI No. 381/2007 about National Tradisional Policy.
- Peraturan Menteri Kesehatan No. 003/2010 about Jamu scientification in service-based research health, aiming to get evidence base in the use of herbs related to the benefits and safety of herbal medicine.
- SK Ka Badan POM – RI No HK.00.05.41.1384 : About traditional medicine registration
- Peraturan Menteri Kesehatan Republik Indonesia Nomor: 246/Menkes/Per/V/1990, About Permits for Traditonal medicine industry and traditional medicine registration
- SK Ka Badan POM – RI No HK.00.05.4.1380, About Guideline for good manufacturing practice for traditional medicine

On the title of Awakening Jamu in 2008, President Republic of Indonesia convey four important related things with the development of herbs are:

1. Establish health and education service system applicable.
2. Enhance research and technological innovation development of herbal medicine.
3. Encourage the herbal medicine industry to enter into the mainstream the global market and the domestic market as well as the very ones important is the Indonesian branding for herbal products.
4. Encourage the development of herbal medicine business

Roadmap (development map) of Indonesian traditional/herbal medicine development 2011-2025 is the direction guide, objectives and development stages Indonesian herbs that have high economic potential to improve people's welfare and competitiveness nation. The roadmap vision is: Jamu Indonesia guarantees World Quality of Life.

According to the roadmap, Ministry of Health mission are (Tjandra YA, 2015) :

- Improving the safety, efficacy and quality of herbal medicine.
- Increasing the independence of raw materials of herbal medicine.
- Develop world-class herbal medicine industry.
- Strengthen local markets and drive global markets.
- Improving the use of herbal medicine in health services.
- Jamu as the brand image of the Indonesian nation.

In order for herbs to increase its role in life of our society, then there are at least five parties have important role. First is certainly the community itself, and this not too difficult because the reality is partly large enough is already using one form of herbal medicine inside household. The second is the health worker, who face to face with patient / society. This is still need challenges, especially scientific evidence that can convince health workers, as well as supportive rules. To obtain scientific evidence it is necessary role of the third actor, is researchers, both at the Research Institute like Agency for Health Research and Development (Balitbangkes) Ministry of Health, or also from the University. The four most important are the Public Policy Makers, which required his political support as well availability of regulations per law required. Meanwhile, the fifth party is also absolutely necessary is the business world, which will produce herbal medicine as a commodity.

The direction of national herbal medicine development is divided into :

1. Development of herbal medicine for health (fitofarmaka).
2. Development of herbs for beauty and fitness.
3. Development of herbs for food and beverages.
4. Development of herbal medicine for tourism and religion.

#### **d. RECENT RESEARCH**

Development of Indonesian traditional/herbal medicine through laboratory research and clinical research lead to phytopharmaca, will help the community in efforts to improve their health condition and economically profitable because the use of traditional medicine reduces the cost of treatment and the development of traditional medicine as a health product will increase the national income (Ministry of Trade, Republik of Indonesia, 2009).

Research activities from upstream to the downstream, starting from exploration and bioprospection of knowledge and germplasm of medicinal plants, standardization of medicinal plants up to formulation, clinical trials, and modernization of herbal preparations (Tjandra Y A, 2015)

Activities undertaken include:

1. Ethnomedicine and Bioprospection Research
2. Research on Standardization of Medicinal Plants
3. Harvest and Post Harvest
4. Phytochemical Standardization
5. Modernization of Herbal Medicine
6. Preclinical Test
7. Clinical Trial
8. Economic, Social, Cultural, Political and Herbal Medicine Research
9. Research on Mining of Iptek of Medicinal and Medicinal Plants Traditionally includes:
  - Marker compound (MC) of Medicinal Plant
  - New Chemical Entity (NCE)
  - Natural Dyes
  - Molecular pharming
  - Natural pesticide
  - Therapeutic protein
  - Functional Food / nutraceutical food
  - Natural Cosmetic
  - Nano Technology

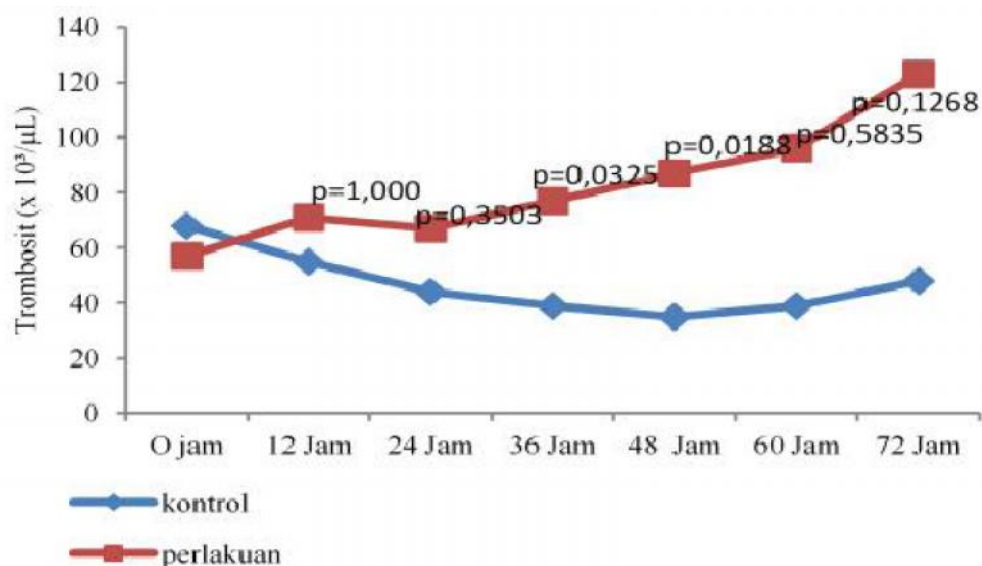
Scientific research have been conduct for many Indonesian traditional herbal medicine, some of them are:

1. *Psidium guajava*, Linn



Guava leaf (*Psidium guajava* Linn.) contains a variety of nutritious components overcoming DHF. Groups of tannins and flavonoids which is expressed as quersetin in a leaf extract Guava can inhibit the activity of reverse enzyme transcriptase so it can inhibit the growth of VD. Guava leaf extract can also increase the amount megakaryocytes in the bone marrow so it can increase the number of platelets in the blood (Achmad & Wahono, 2001; Soegijanto et al., 2010).

The clinical study on effect of supplement psidii folium and red fermented rice extract in management for increasing thrombocytes in patient sufferings Dengue Hemorrhagic Fever (DHF) at RSUP. DR. M. Djamil Padang has been done. The research was conducted using quasi experimental method with pre and post test design. The subjects were 20 patients and willing to give informed consent was included. Patients with hematology abnormality, heart and lung disease, salicylic acid treatment, severe hemorrhagic condition, and descent consciousness were excluded. An amount of thrombocytes were measured every 12 hours in a day. Furthermore, the changes of thrombocytes count from start to end were analyzed using t-independent-test (to analyze the difference of changes between groups) and chi-square (to analyze the response rate between groups). In this trial of 20 subjects, the thrombocytes count of the test group was significantly increased compared with the control group  $p < 0.05$  ( $p = 0,0120$ ) and the increasing of thrombocytes response rate in the test group was significantly different from that in the control group  $p < 0.01$  ( $p = 0,0034$ ). As conclusion, the results of this trial have proven that psidii folium and red fermented rice extract could treat thrombocytopenia.



Gambar 3. Grafik perbandingan perubahan jumlah trombosit pada (Septi Muharni, et al, 2013)

## 2. *Centella asiatica*



Some of the active ingredients contained include triterpenoid saponins with the main elements consisting of asiaticosida and madekassosida, triterpen genes, essential oils, flavonoids, phytosterols, and sugars. Other active ingredients are tannins, amino acids, fatty acids, alkaloids, and mineral salts (Kumar and Gupta, 2006)

This research used completely randomized design one way analysis of varian (ANOVA) was found out the effect of Centella leaf extract on spermatid development on rat. Twelve 3.5 months old rats weighing of 150 to 250 g were used in this study. The rats were equally divided into four groups with three replications. Group K0 was negative control group, K1, K2, and K3 were treated with Centella leaf extract with the concentration of 125, 250, and 500 mg/kg, respectively. The treatment was done for 30 days. At the end of the treatment, the rats were sacrificed and the testes was collected then processed for histological examination. The histological slide was stained using periodic acid Schiff (PAS) to observe the spermatid development by detecting the present of neutral carbohydrate in spermatid acrosome cap. The data were analyzed with ANOVA. The results showed that the average number of spermatid cells from treatment groups was lower than that of control group. The highest number of spermatid cells was showed in K0 ( $308.00 \pm 56.33$ ) followed by K1 ( $234.38 \pm 19.81$ ), K2 ( $218.50 \pm 5.48$ ), and K3 ( $208.05 \pm 27.35$ ). The statistical analysis showed that there were significance differences ( $P < 0.05$ ) between K0 and K2, K0 and K3. In conclusion, the Centella leaf extract reduce the spermatid development rate (Wahyu Sihombing, et al 2015).

## 3. *Phyllanthus niruri*



Meniran (*Phyllanthus niruri*) is a potential plant as a hepatoprotector agent. 6-8 Chemical substances contained Phyllanthin and hypophyllanthin, have antioxidative effects and effects antihepatotoxic against CCl<sub>4</sub> and galactosamine. Phyllanthin also improves via hepatocyte viability, prevents the release of hepatic enzymes, decreases lipid peroxidation, and enhanced glutation. Phyllanthin is present in roots, stems, leaves, and fruit seeds meniran. The highest level is in the leaves. Concentration Phyllanthin itself depends on the location of the planting, especially the height of soil factor.

*Phyllanthus niruri* has a potency as hepatoprotector because it contains phyllanthin and hypophyllanthin. This substances have ability as antioxidant agent, increasing hepatocyte viability, decreasing lipid peroxyde, and increasing glutathion. Randomized study postest



control group design using Balb/C mice as sample have done to learn AST and ALT changes between mouse that induced by *Phyllanthus niruri* and not after acetaminophen induced toxicity. Study on twenty four mouse that fulfilled inclusion and exclusion criteria were randomized and classified became 4 groups equally, that were control group, group that induced by acetaminophen only, group that induced by acetaminophen and 0,39 mg dose *Phyllanthus niruri*, and group that induced by acetaminophen and 3,9 mg dose *Phyllanthus niruri*. *Phyllanthus niruri* extract administered orally for 7 days. After treatment, mice blood was taken to measure AST and ALT level. The data were described in table and picture form. Statistic test used Kruskal-Wallis test. From Kruskal-Wallis test, AST p score was 0,168 and ALT p score was 0,726. Both of them showed that there was no AST and ALT level change between 4 mouse group. **Conclusion:** There was no AST and ALT difference between Balb/C mouse induced by *Phyllanthus niruri* and Balb/C mouse that not induced by *Phyllanthus niruri* after acetaminophen induction (Majiid Sumardi, 2010).

#### 5. *Garcinia mangostana* L.



Mangosteen (*Garcinia mangostana* L.) is a fruit tree originated from south-east Asia including Indonesia, Thailand, Malaysia and Myanmar. Generally, people use only the fruit and discard its hull or rind. Traditionally, part of the tree used for medicinal purpose is the rind or hull as herbal remedies such as diarrhea, dysentery, eczema and other skin disorders. The fruit hulls of mangosteen are well known to be rich in xanthone compounds. From bioassay-guided isolation study, the most active xanthenes are alphamangstin, gamma-mangostin and garcinone-E. Extensive research has shown that extracts of mangosteen hulls and the xanthenes exhibit a wide range of pharmacological activities such as anti-allergy, antiinflammatory, anti-oxidant, anti-carcinogenic, anti-microorganism, anti-atherosclerosis and anti-HIV. The ethanolic extract of the hull containing major active xanthone was reported to be non-toxic in both acute and sub-chronic toxicity studies. (Agung EN, 2014).

#### 6. *Nigella sativa*



*Nigella sativa* is an annual herbaceous, dicotyledon belonging to the Ranunculaceae family (Al-Gaby 1998; Atta 2003) and widely distributed in Asian and Mediterranean countries (Nair *et al.*, 2005) as well as in Europe and northern Africa (Salem 2005). The plant is bushy, self-

branching with white or pale to dark blue flowers (Salem 2005) The numerous white trigonal seeds are contained within a fruitcapsule which on maturation opens up and the seeds are consequently exposed to the air thus turning black in color (Schleicher and Saleh 1998). In Bahasa Indonesia, it is known as jintan hitam or black cumin (Elliott and Brimacombe 1987). The plant has a rich historical and religious background and was referred to by the prophet Mohammed for its healing powers (Goreja 2003) and has been mentioned in the Holy Bible as “the curative black cumin” (Junemann 1998). Jintan hitam, or black cumin seed oil extract, has been used for thousands of years as a spice, condiment, carminative and food preservative, as well as a protective and curative treatment for numerous disorders in traditional and Indian folk medicine (Aboutabl *et al.*, 1986; El-Sayed *et al.*, 1996; Merfort *et al.*, 1997; Nadkarni 1976; Nair *et al.*, 2005). In Indonesia, the seeds of *Nigella sativa* are ground with white cumin (*Cuminum cyminum*) seeds or jintan putih and the leaves of *Citrus aurantium* (bitter orange – an important Chinese herb) and applied to the forehead to relieve headaches (Elliott and Brimacombe 1987). The seeds are also used as an ingredient for an oral remedy that is used for the treatment of arthritis and other joint diseases (Elliott and Brimacombe 1987). The ability of the black cumin seeds to relieve the effects of arthritis can be attributed to the anti-inflammatory properties of the seeds (Ali and Blunden 2003). Morsi (2000) also used both the crude alkaloid extract and the water extract prepared from the seeds of *Nigella sativa* to screen the efficacy of the extracts against a variety of organisms isolated from human patients suffering from septic arthritis and noted that (a) the Gram negative isolates were affected more than the Gram positive isolates and (b) also the antibacterial action was concentration dependent. The antifungal activity of *Nigella sativa* has been assessed against the yeast *Candida albicans* (Khan *et al.*, 2003) and the dermatophytes (Aljabre *et al.*, 2005). One of the major components of the essential oil from *Nigella sativa* is the thymoquinone (Ali and Blunden 2003) that readily dimerizes to form dithymoquinone (El-Dakhkhny 1963). From a study carried out by Aljabre *et al.* (2005) against eight species of dermatophytes, four species of *Trichophyton rubrum* and one each of *Trichophyton mentagrophytes*, *Epidermophyton floccosum* and *Microsporum canis* using ether extract of *Nigella sativa* and its active principle thymoquinone it was apparent that *Nigella sativa* retains the potential to be used as a source in the development of antidermatophyte drugs. Other than antimicrobial activity, studies have shown that thymoquinone from *Nigella sativa* is also attributed with many other therapeutic properties for e.g. it protects the hepatocytes and therefore the liver from exogenous toxins (Badary *et al.*, 2000; Daba and Abdel-Rahman 1998), it also protects the liver from the toxic effects of cisplatin and carbon tetrachlorides (El-Daly 1998; Nagi *et al.*, 1999), enhances the antitumor effect of ifosfamide on induced ascites carcinomas (Badary 1999) and increases the resistance of mixed lymphocytes in culture against mitogens and exerts additional immunomodulatory effects by influencing the production of interleukin IL 1 $\beta$ , IL-8 and TNF- (Haq *et al.*, 1995). The efficacy of the plant in the treatment of skin conditions such as eczema has also been recognized worldwide (Goreja 2003). Moreover studies carried out by Kalus *et al.* (2003) have also proved that the oil of *Nigella sativa* is capable of relieving symptoms of allergic diseases such as allergic rhinitis, atopic eczema and bronchial asthma. Thus in the traditional folk medicine of the Middle and Far East, black cumin seeds have been used to treat a wide range of illnesses, encompassing bronchial asthma, headache, dysentery, infections, obesity, back pain, hypertension and gastrointestinal problems (El-Dakhkhny 1965; Schleicher and Saleh 1998). According to Salem (2005), the seeds are also ground to a powder, mixed with a little flour as a binder, and applied externally to treat abscesses, nasal ulcers and rheumatism. Black seed extract or oil has also been reported to possess (a) antioxidant activity by Burtis and Bucar (2000), (b) antitumor activity by Worthen *et al.*, (1998), and (c) the potential to induce stimulatory effect on the immune system by Salem and Hossain (2000). (Robin, *et al.*, 2007)



**e. MEDICAL AND PUBLIC HEALTH ASPEC**

Development and improvement of traditional medicine is aimed to Obtain traditional medicine of high quality, safe, have scientifically proven, and utilized, benefits broad, both for self-treatment by the community and used in formal health services.

The objectives of national traditional medicine policy are (Keputusan Menteri Kesehatan Nomor : 381/Menkes/SK/III/2007):

1. Encourage the utilization of natural resources and potions traditional sustainable use (for sustainable use) used as a traditional medicine in an effort to increase health services
2. Ensure the transparent management of Indonesia's natural potential sector in order to have high competitiveness as a source economy of society and sustainable state's foreign exchange.
3. The availability of traditional medicine that is guaranteed quality, efficacy and its safety, scientifically tested and widely used both for self-treatment as well as in service formal health.
4. Making traditional medicine a superior commodity provides multi benefits that increase growth economic community, providing employment opportunities and reduce poverty.

Utilization of medicinal plants and herbal medicine by family is also useful in strengthening preventive-promotive efforts. For example, the results of Riskesdas 2013 show that about 40 million Indonesians have hypertension. One of the idea that develops is if people plant celery and a cat's whiskers around the house and given counseling on how to prepare and prepare Jamu Hypertension, then people suffering from hypertension will able to maintain their own health. All levels of society and all stakeholders are necessary to revive the Family Drug Park activities or TOGA equipped with counseling by health personnel. Mainly on how to utilize the medicinal plants good and correct - for the maintenance of health, fitness, and treatment of everyday or common diseases. The development of TOGA can also be expanded to supplement family income or income generating activities. For example with production activities healthy drinks, such as red ginger drink, wedang secang, kencur rice, temulawak tea, and slimming tea.

(Tjandra Yoga Aditama, 2015)

**f. ECONOMICAL PROSPECTIVE**

The world herbal market in 2008 was around US \$ 60 billion with the largest market is Asia (39%), followed by Europe (34%), North America (22%) and other parts of the world by 5%. The market value will continue to rise and estimated at US \$ 150 billion by 2020. From the total value of trading the world's herbal products, turnover sales of Indonesian herbal products only reached US \$ 100 million per year (0.22%) which certainly has a great chance to improved. The growth of herbal medicine market in Indonesia as well showed a significant increase. In 2003 the market value of herbal medicine in Indonesia amounted to 3 trillion rupiah, increased to 5.3 trillion rupiah in 2006, and 7.2 trillion in 2008. In 2010 the market value of herbal remedies Indonesia has reached 10 trillion rupiah. Up to you year 2010 recorded the number of industries in the field of Traditional Medicine as many as 1908 consists of 79 Traditional Medicines Industry (IOT), 1413 Small Industry of Traditional Medicine (IKOT) and 416 industries Household (PIRT). Potential development of herbal medicine high, herbal medicine can enter in the mainstream of global market by optimally empowering economic and business opportunities.

Data from Indonesia in 2014 amounting to Rp 15 Trillion and in year 2015 is expected to be Rp 20 Trillion. Data also shows that there are 1,160 herbal industries, consisting of large industries and 1,144 small and medium industries. Power the work involved in the herbal medicine industry is about 15 million person. The export value of this industry in 2013 amounted to 4.97 million USD, in 2014 (Jan-Oct) of 6.61 million USD. Exports of large

herbal raw materials are among others to Hongkong as much as 730 tons of 647,000 USD and also to Germany as much as 155 tons of 112,400 USD.

Standardization of Indonesian herbal medicine especially the standardization of simplicia and preparations extract has significance to maintain the quality of herbal medicine. Limitations on moisture content, microorganisms and others very important to ensure security use of herbal medicine as well as reference in producing herbal medicine scale industry. Economic value added from simplicia and extracts standards, are far away bigger than the ones that have not standardized (Tjandra YA, 2015).

#### g. CONCLUSION

- o Indonesia is a rich country biodiversity and traditional knowledge including the traditional medicine. However, in the global era, the richness of biodiversity is not the determining factor for prosperity of the people.
- o Indonesian herbal remedies include Jamu need to be developed with research which has a strong scientific base so it can be integrated properly in the national health care system. The cultivation of Indonesian medicinal plants is important to do besides to keep its sustainability, also to improve the quality of Indonesian herbal medicine with value added bigger economy. Structuring simplicia and herbal medicine Indonesia as well assurance of quality, security and its usefulness is a strategic aspect in both medical and economic perspective.
- o Indonesia have to work collaboratively also with other countries in traditional medicine improvement.

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