Preparation of Various Type of Medicinal Plants Simplicia as Material of *Jamu* Herbal

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Abstract. The people generally did not know how to stock simplicia as a herb. Usually the people just know how to make the herbs with boiling the material. Simplicia stocking with health requirements still yet to be considered, they lack in how to collect, make, and save. The objective of this research is to describe hygiene simplicia stocking. Descriptive qualitative research method. Research result in simplicia stocking in medical herbs: how to collect the material; and the technique.

Key word: simplicia, medicinal plants.

Indonesian society has been using medical herbs from times to times in order to improve health (promotive), restore health (rehabilitative), disease prevention (preventive), and curing disease (curative). In this modernization day, plants that used as a medicine is vast in growth. The herbal needs as a medicine is important, that it needs solution on how to provide the medical plant from the environment. Medical plant can be empowered with the local resident in Taman Nasional Bromo Tengger Semeru (TNBTS) in Malang, East Java.

The result of research in 2015 and 2016 indicates that medical plant in TNBTS Malang is rarely used by local resident as a medicine. The herbaceous plants and trees identified as a medical plant from Zingiberaceae and Solanaceae tribe. Total species that has been found is 478 species. Based on the survey from 5 districts in Malang, indicates that the local resident in TNBTS less care about the biological resources around them that has economical value and health value (Indriwati, 2015). The indication that showed local resident's un-involvement for the medical plant is showed by the abandonment of the plants that have potential to be a medicine. For instance in Ngadas village in Poncokusumo district, the leek (*Allium fistulosum*) picked only the biggest one to sell, while the remaining is just wasted (Ella, 2016); *Sizygium polyanthum* is abundant in Wangkalkidul village Poncokusumo district (Restu, 2016; Rimba, 2016); *Codiaeum variegatum* is abundant in Tumpang district (Rosita, 2016); *Hymenocallis littoralis* is abundant in Wagir district (Nabila, 2016); *Cordiline fructicosa* is abundant in Turen district (Puspa, 2016); and *Ixora paludusa* is abundant in Bantur district (Nanik, 2016).

Fact about this un-involvement done by locals with the medical plants, is concluded from the existence of synthetic medicine the locals get from the drug store than using the said medical plants. Moreover, the locals also use a shortcut to go to drug store for a generic drug with affordable price and service. This low public knowledge about local biological resource to overcome various diseases needs to be improved so that the knowledge and culture of the locals of their ancestors about traditional medicine can be used once more and preserved.

The form of the promotion can be start with a simplicia as a raw material for traditional herb. The standardization of simplicia aside from raw material for herb, can also used to overcome the needs of raw material of herb on certain season, for example : rain season, where the weather is not suitable for making of simplicia, because the raw material can only be harvested on the certain season. The making of traditional herb needs certain something so that the herb that consumed by client is healthy. The quality herb is made with a raw material

selection, produced from a simplicia considering the hygienic standard. The quality parameter of simplicia can be based on content of moisture after drying, in this case it is less than 10%.

Several countries in Europe, Asia, America and WHO decided standardization row material for herbal product. The standardization of simplicia that will used for the making of traditional herbs must fulfill the requirements of monograph published by the official Department of Health (Materia Media Indonesia, 2006). Simplicia product that directly consumed must meet the requirements of pharmaceutical products in accordance with applicable regulations (Depkes RI, 2000). Characterization simplicia including macroscopic test, microscopic test and simplicia identification (Depkes RI, 1995). The percentage of water content that is used as a parameter is less than 10% with expectation the simplicia is clean and not overgrown by fungus (Winangsih, 2013). The chemical content should not be damaged due to the drying process (Pramono, 2006).

The quality of herbs is determined by the stock of simplicia from variety of plants that is needed. Simplicia stocking is an important phase in keeping the balance of chemical component in simplicia. Simplicia stocking included how to gather, make, and save. The gathering of the specimen for simplicia depends on the plants, and the age of the plants. The part of the plants that required is the root and rhizomes, bark, leaves and shoots, flowers, fruits, and seeds. Roots and rhizomes are collected when the growth is stopped. Bark is collected when the plant is old enough. Leaves and shoots were collected when the plant is blossom. The flowers is collected when the pollen is formed. The fruit is collected when it is old enough but not too ripe, while the seed is collected when the fruit is old. An agricultural product collected when the plants begin to form a flower, while the woody plant is taken when the plant is old.

How to make simplicia is start from wet sorting, washing, drying, chopping, and dry sorting. Wet sorting is done to remove foreign object from the plants. Washing is done for cleaning the plants from microbe and dust with a flowing water, the duration of washing is different from each different plants. Chopping is done to speed up the drying process, easier for milling, and packing. Chopping sought not too thin to avoid the loss of active substance in the plants. Simplicia drying, must meet the quality requirements in order to keep the simplicia from fungus, the active substance was not damaged by the action of the enzyme and its chemical content is not damaged.

Drying technique can be done naturally and artificially. Drying naturally can be done with direct sun light and with wind. Drying artificially can be done with blower and oven. The place for simplicia drying, is recommended using a woven bamboo with a hole in it for air circulations, and not using metal to prevent the active substance for being damaged. Artificial drying using blower and oven need to pay attention to temperature, pressure and airflow required, to keep the active substance. Dry sorting is done to remove foreign object in dry simplicia, using manual technique and mechanic. Saving is start by packing with a plastic, bottle, or other material. Saving is done to avoid simplicia being damaged by light, oxidation, enzimatic reaction, dehydration, bacteria, bugs, and dirt.

The people generally can make their own herbs, but they are still unable to prepare the simplicia as a raw material that meet the health requirements. They make simplicia as they know from their ancestor, with traditional process. Material that will be used as simplicia usually without sorting, washing, and drying process without regard to the stability of the chemicals and contamination of a wide variety of microbes (Indriwati, 2016). This also goes for the simplicia saving are done without regard to the quality standard simplicia. The objective of this research is to describe hygiene simplicia stocking to help the people in Malang to make traditional herbs from herbal ingredients.

RESEARCH METHODOLOGY

The study was conducted in the laboratory of Biology, State University of Malang in August to October 2016. The material used was Sizygium polyanthum plants (roots, stems, leaves, flowers, fruits), *Cordiline fructicosa* (leaf), *Codiaeum variegatum* (leaves and roots), *Allium fistulosum* (leaves and roots), Hyacinths (*Hymenocallis littoralis*) was obtained from various districts in the regency of Malang. The tools used in the simplicia process is winnowing, knife / scissors, washing tool (bucket), drying tools (blower, oven), tools storage (boxes, plastic bags, bottles, labels), stationary. Sampling method done by purposive sampling based on the abundance of plants in a region. Samples of *Sizygium polyanthum* was obtained from the sub – district of Poncokusumo, sample flowers of *Allium fistulosum* (leek) taken from the sub – district of Poncokusumo, *Codiaeum variegatum* from the sub – district of Tumpang, *Cordiline fructicosa* from the sub – district of Turen, *Hymenocallis littoralis* from sub – district of Wagir, and *Ixora paludusa* from sub – district of Bantur ,

This study used a Completely Randomized Design with 5 treatments and repeated 3 times. The treatments tested were: 1) The water content of each part of the plant, 2) long drying time of each part of the plant, and 3) how to drying. Simplicia quality parameters were analyzed by levels of water that contained after drying is not more than 10%. How determination of moisture content using the dry weight percentage calculations divided to the wet weight multiplied by 100%. This method is done by carefully weighing the dried material simplicia before and after drying. The direct sun drying is done for 3-6 days, the length of time of drying during 3 hours (08.00 to 11:00). Drying using a dry wind, carried out for 4-6 days, the length of time of drying for 3 hours (08.00 to 11:00).

RESULTS AND DISCUSSION

Analysis of the quality parameters simplicia with five drying treatments was observed and showed there are differences among the treatments of drying the moisture content of simplicia. Drying oven showed that the lowest water content (8.16%), then sequentially followed by a combination of sun-blower (8.48%), blower (8.76%), direct sunlight (9.52%), and dry wind (9.81%). Drying oven, the combination of sun-blower, and blower showing a relatively low water content but the significance of test results among the three treatments were not significantly different. In addition, the three treatments showed significantly different from the other two treatments (direct sunlight and dry wind). Drying with direct sun and dry wind showed there was no significantly different results. Analysis of the five drying treatments result showed there was difference among treatments drying towards the long drying time. Drying oven showed the shortest length of time (14.42 hours), the next in succession, followed by a combination of sun-blower (16.37 hours), blower (16.57 hours), the direct sun (87.34 hours), and dry wind (108.04jam).

Simplicia best quality results compared to the way the wind dried, oven, drying in the sun, or the blower only. It can be seen from all the observed variables (Table 1).

Water Content in Different Ways Drying Plants

Table 1 Crude Quality Characteristics Drying In Different Ways

Drying methode	*Simplisia Randement*																																	
	Syzigium polyanthum															*C.fructicosa*			*C. variegatum*						*A. fistulosum*						*H. littoralis*			*I. paludusa*		
	Root			Bark			Leaf			Flower			Fruit			Leaf			Root			Leaf			Root			Leaf			Leaf			Flower		
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Sun and Blower	8.56	8.85	7.88	8.59	8.44	8.25	7.94	8.24	8.75	7.88	7.90	8.08	8.06	8.30	8.56	8.24	8.73	7.94	8.14	8.76	8.45	8.04	8.54	8.01	8.20	8.88	8.62	8.22	8.49	8.19	9.90	7.75	7.96	8.49	7.36	8.21
Blower	8.94	9.15	8.11	9.28	8.98	8.75	9.01	8.94	9.90	8.11	8.25	8.30	8.33	8.45	9.32	9.04	8.95	9.01	8.98	8.88	8.05	8.84	8.67	8.31	8.80	8.96	8.97	9.06	8.98	8.37	8.75	7.89	8.23	8.78	7.41	8.33
Oven	8.05	8.16	7.73	8.17	8.18	8.11	7.52	8.11	8.16	7.73	7.83	7.89	7.74	8.18	8.47	8.01	8.25	7.51	8.18	8.16	7.52	7.69	8.22	7.89	8.35	8.77	8.53	7.81	7.73	8.00	8.16	7.50	7.81	7.41	7.25	8.02
Sun	9.44	10.07	8.54	9.60	9.68	10.00	9.58	9.52	9.97	8.54	9.04	8.91	9.32	9.74	10.03	9.62	9.97	9.58	9.38	9.55	10.01	9.52	9.75	8.66	9.40	9.76	9.57	9.48	9.45	9.04	10.07	9.99	9.67	9.03	8.27	8.47
Win	9.90	10.02	9.77	9.94	9.88	10.15	9.82	9.85	10.14	9.77	9.79	9.99	9.74	10.22	10.35	9.83	10.27	9.82	9.58	10.07	9.90	9.72	10.00	9.76	9.50	9.88	9.65	9.44	9.54	9.42	10.02	10.07	9.78	9.26	8.51	8.69

Table 3. DMRT of Water Content in Simplisia Flowers

Flower					
S. polyanthum			***I. paladusa***		
Drying Methode	Water content	Notation DMRT	Drying Methode	Water Content	Notation DMRT
Oven	7.82	a	Oven	7.56	a
Sun & Blower	7.95	a b	Sun & Blower	8.02	a
Blower	8.22	b	Blower	8.17	a
Sun	8.83	c	Sun	8.59	b
Win	9.85	d	Win	8.82	b

Table 4. DMRT of Water Content in Simplisia Root

Root								
S. polyanthum			***C. variegatum***			***A. fistulosum***		
Drying Methode	Water Content	Notation DMRT	Drying Methode	Water Content	Notation DMRT	Drying Methode	Water Content	Notation DMRT
Oven	7.98	a	Oven	7.95	a	Oven	8.55	a
Sun & Blower	8.43	a b	Sun & Blower	8.45	a	Sun & Blower	8.57	a
Blower	8.73	a b	Blower	8.64	a	Blower	8.91	a
Sun	9.35	b c	Sun	9.65	b	Sun	9.58	b
Win	9.9	c	Win	9.85	b	Win	9.68	b

Table 5. DMRT of Water Content in Simplisia Leaves

Leaf															
S. polyanthum			*C. fructicosa*			*C. variegatum*			*A. fistulosum*			*H. littoralis*			
Drying Methode	Kadar Air	Notasi DMRT	Drying Methode	Kadar Air	Notasi DMRT	Drying Methode	Kadar Air	Notasi DMRT	Drying Methode	Kadar Air	Notasi DMRT	Drying Methode	Kadar Air	Notasi DMRT	
Oven	7.93	a	Oven	7.92	a	Oven	7.93	a	Oven	7.85	a	Oven	7.82	a	
Sun & Blower	8.31	a	Sun & Blower	8.3	a	Sun & Blower	8.2	a b	Sun & Blower	8.3	b	Sun & Blower	8.29	a	
Blower	9.28	b	Blower	9	b	Blower	8.61	b	Blower	8.8	c	Blower	8.54	a	
Sun	9.69	b	Sun	9.72	c	Sun	9.31	c	Sun	9.32	d	Sun	9.91	b	
Win	9.94	b	Win	9.97	c	Win	9.83	c	Win	9.47	d	Win	9.96	b	

Table 6. DMRT of Water Content in Simplisia Bark and Fruits

S. polyanthum					
Bark			**Fruit**		
Drying Methode	Water Content	Notation DMRT	Drying Methode	Water Content	Notation DMRT
Oven	8.15	a	Oven	8.13	a
Sun & Blower	8.43	a	Sun & Blower	8.31	a
Blower	9	b	Blower	8.7	a
Sun	9.76	c	Sun	9.7	b
Win	9.99	c	Win	10.1	b

Sequentially parts of plant that occupied the lowest water content: flower, root, leaf, fruit and bark. Drying method which is more effective in a sequence that is oven, sun & blower, blower, sun and win. With oven drying method is more effective in the drying of simplicia in order to obtain the lowest water levels are the flowers of *I. paladusa* amount 7.56% and flower plants *S. polyanthum* amount 7.82%. The water content of simplicia dried in an oven using a temperature of 65 °. Drying the flowers and leaves must be maintained to its original color and aroma of the plants have not changed. In general herb leaves and flowers can be dried only between a temperature of 20 ° - 40 ° C, bark and roots at a temperature of 30 ° - 65 ° C (Manoi, 2006).

The drying method of simplicia on a plant of *I. paladusa* and *S. polyanthum* using the oven, sun & blower and blower did not show the different significantly, but differs significantly by using sun drying methods and wind. Due to the temperature of the environment when done naturally with long drying time of drying for 3 hours (08.00 s.d 11.00), natural drying temperature (wind and solar) has a temperature for almost ranging from 30 ° -35 ° C. Low water content by oven drying method is caused by the higher temperature used, So as to be higher the process of transpiration (Winangsih, et al, 2013). Oven drying method with a faster and give better results in the review of terms of physical appearance (Cahyono, et al, 2011). Flowers of *I. paladusa* has the lowest water levels due to the funnel-shaped petals with a length of 0.5 cm, and compressed while occupying the second position with low water content which *S. polyanthum* flower with petals like a bowl shape, a length of about 4 mm, and quickly fall out, based on the characteristics of the water content at the flower had a lower rate and faster release of water in the form of water vapor. According to Pramono (1985) that the drying of the flowers and leaves must be maintained to its original color and aroma of the plants have not changed. In general herb leaves and flowers can be dried only between a temperature of 200-400 C, bark and roots at a temperature of 300-650 C. Moreover, according to Brotosisworo (1984) the changes that occur during the drying is enzymatic hydrolysis, the browning accompanied by flavor alteration and its activity, fermentation, oxidation and polymerization.

The next part is the root of plant organs, with the sequence of a plant that has the lowest water content by oven drying methods, namely *C. variegatum* 7.95%, 7.98%, *S. polyanthum*, and *A. fistulosum* 8.55%. Root drying method using an oven, sun & blower, and blower did not differ significantly, but differs significantly by using sun drying method, and win. On *C. variegatum* plant species and *S. polyanthum* has a taproot, and light yellow and brown so that the level of water in the two plants are not much different, whereas the roots of the *A. fistulosum* have root fibers, flat, brownish white, and not long. When the roots of the plants *A. fistulosum* dried then the color changes to yellow, the stronger intensity of the yellow color of the root *A. fistulosum* the flavonoids contained in the extract will be higher.

The next plant organ part that leaves, with a sequence of a plant that has the lowest water content by oven drying method is the plant amounted to 7.82% *H. littoralis*, *A. fistulosum* by 7.85%, amounting to 7.92% *C.fructicosa*, *C.variegatum* amounted to 7.93 %, and *S. polyanthum* amounted to 7.93%. Leaf drying method using the oven, sun & blower, and blower did not differ significantly, but differ significantly from the drying method using the sun, and win. At species *H. littoralis* has a single leaf, lanceolate, length of 32-120 cm, 3-10 cm wide, thick, tapered tip and when the cross section seen green holes, holes that makes the leaves of *H. littoralis* has the level of water is low compared to other plants in leaf organs and accelerate the process of transpiration, *A. fistulosum*, the plant has leaves elliptical leaf-like cavity in the pipe (Sumpena, no year), this plant also has a number of water content not much different from plants *H. littoralis*. *C.fructicosa* plant has a special feature single leaf with warnam brownish red and some are green, oblong-shaped with 20-60 cm long and 5-13 cm wide. Drying with wind aims to prevent the loss of the enzyme and secondary metabolites contained in sempel caused by rising temperatures (evaporate) or reactions that occur due to UV rays from the sun (Gunawan, et al, 2013). *C.variegatum* plants have a single leaf, alternate, petiole rounded, 1-4 cm long leaf shapes vary lanceolate, elliptical, flutter, undulations and circular egg, smooth shiny surface and 25-35 cm long leaves, and plants S. polyanthum single leaf lies opposite, with stems up to 12 mm. Leaf blade elliptic oblong, narrowly elliptic or lanceolate, 5-16 x 2.5 to 7 cm, bald, with 6-11 secondary veins, and inline apparent intramarginal veins clearly seen near the edge of the blade, speckled oil glands which is very soft (Direktorat Bina Perbenihan Tanaman Hutan, 2012), leaves of *S. polyanthum* have a thick leaf meat so that the level of water held much different from *H. littoralis*. Cutting the leaves also affect the speed of the process of transpiration (loss of water in the tissues). Selection of the leaves used are healthy leaves with a characteristic flourish, no black spots and free of insects.

The next plant organ part is the fruit of *S. polyanthum* with the level of water at 8.13% through drying oven method. Fruit ranks fourth in the number of water levels nearing 10%. The laurel is a berry fruit, round, 8-9 mm in diameter, young fruit is green, after cooking to dark red to purple-black, and it feels a bit astringent (Direktorat Bina Perbenihan Tanaman Hutan, 2012), due to larger fruit diameter, causing the amount of water content in the fruit is nearing 10%.

The next part of plants organ namely bark on *S. polyanthum* plant with the amount of water content as 8.15% by oven-drying method. A bark occupies the fourth order in the amount of water content almost 10%. The percentage of the number of water content on fruits and bark are not too different. It caused by the thickness of the bark on the *S. polyanthum* woody plant that categorizes into chelates wood (building material and household furniture) so that the amount of water content obtained is greater, bark contains of tannin which is used as a dye and for preservative nets, the material woven bamboo and others (Direktorat Bina Perbenihan Tanaman Hutan, 2012).

Time of Simplicia Drying (in hours) in the Various Ways of Drying

Table 7.Time of Simplisia Drying in the Various Ways of Drying

Drying methods	LAMA PENGERINGAN DALAM JAM																																						
	Syzigium polyanthum															C.fructicosa			C. variegatum						A. fistulosum						H. littoralis			I. paludosa					
	Root			Bark			Leaf			Flower			Fruit			Leaf			Root			Leaf			Root			Leaf			Leaf			Flower					
	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3	1	2	3
Sun and Blower	25.34	24.55	25.06	26.54	26.55	26.36	24.53	24.45	24.05	18.10	18.25	18.45	20.55	21.05	21.30	19.20	19.35	18.55	11.55	11.50	12.00	13.05	13.10	13.45	11.05	11.10	11.55	12.25	12.55	11.55	16.45	16.30	15.55	7.10	7.50	7.45			
Blower	27.23	26.58	27.15	28.53	27.57	28.55	25.55	25.00	25.08	19.05	19.20	18.50	22.15	22.30	22.45	20.10	20.15	20.30	12.45	12.30	12.35	15.15	15.05	14.55	10.20	10.35	10.55	14.20	13.55	14.05	17.20	17.50	18.00	9.20	9.55	9.45			
Oven	23.20	23.45	22.55	26.42	25.42	24.45	23.55	24.00	24.15	17.30	17.55	18.05	20.10	20.15	19.55	18.45	17.55	18.40	10.45	11.05	11.00	12.20	12.55	13.05	9.40	9.35	9.30	10.25	10.25	10.45	15.15	14.55	15.05	4.05	4.30	3.55			
Sun	90.30	89.50	92.10	128.15	131.25	129.45	95.30	99.00	97.15	108.25	109.05	110.05	118.45	110.55	120.15	144.55	146.20	145.50	99.05	98.15	99.10	94.25	95.20	93.55	72.50	72.35	73.05	76.15	77.05	76.55	128.00	126.55	127.15	23.55	24.05	23.45			
Win	139.35	135.45	140.05	167.45	170.05	169.10	144.05	150.05	149.30	125.15	126.30	124.55	130.20	129.55	131.30	161.15	163.05	162.45	109.55	112.05	111.30	107.30	106.45	107.05	73.40	74.10	73.55	85.45	87.05	87.00	132.25	133.15	132.45	35.15	36.05	35.55			

Table 8. DMRT of Water Content Test on Simplisia Flower

Flower					
S. polyanthum			***I. paladusa***		
Drying Method	Water Content	Notasi DMRT	Drying Method	Water Content	Notasi DMRT
Oven	17.63	a	Oven	3.97	a
Sun & Blower	18.27	a b	Sun & Blower	7.35	b
Blower	18.92	b	Blower	9.4	c
Sun	109.12	c	Sun	23.68	d
Win	125.33	d	Win	35.58	e

Table 9. DMRT of Water Content Test on Simplisia Root

Root								
S. polyanthum			***C. variegatum***			***A. fistulosum***		
Drying Method	Water Content	NotasiDMRT	Drying Method	Water Content	Notasi DMRT	Drying Method	Water Content	Notasi DMRT
Oven	23.07	A	Oven	10.83	a	Oven	9.35	a
Sun & Blower	24.98	a b	Sun & Blower	11.68	a b	Sun & Blower	10.37	b
Blower	26.99	b	Blower	12.37	b	Blower	11.23	c
Sun	90.63	C	Sun	98.77	c	Sun	72.63	d
Win	138.28	D	Win	110.97	d	Win	73.68	e

Table 10. DMRT of Water Content Test on Simplisia Leaf

Leaf														
S. polyanthum			***C. fructicosa***			***C. variegatum***			***A. fistulosum***			***H. littoralis***		
Drying Methode	Kadar Air	Notasi DMRT	Drying Methode	Kadar Air	Notasi DMRT	Drying Methode	Kadar Air	Notasi DMRT	Drying Methode	Kadar Air	Notasi DMRT	Drying Methode	Kadar Air	Notasi DMRT
Oven	23.9	a	Oven	18.13	a	Oven	12.6	a	Oven	10.32	a	Oven	14.92	a
Sun & Blower	24.34	a	Sun & Blower	19.03	a b	Sun & Blower	13.2	a	Sun & Blower	12.12	b	Sun & Blower	16.1	b
Blower	25.21	a	Blower	20.18	b	Blower	14.92	b	Blower	13.93	c	Blower	17.57	c
Sun	97.15	b	Sun	145.42	c	Sun	94.33	c	Sun	76.58	d	Sun	127.23	d
Win	147.8	c	Win	162.22	d	Win	106.93	d	Win	86.5	e	Win	132.62	e

Table 11. DMRT of Water Content Test on Simplisia Bark and Fruit

S. polyanthum					
Bark			**Fruit**		
Drying Method	Water Content	Notasi DMRT	Drying Method	Water Content	Notasi DMRT
Oven	25.43	a	Oven	19.93	a
Sun & Blower	26.48	a b	Sun & Blower	20.97	a
Blower	28.22	b	Blower	22.3	a
Sun	129.62	c	Sun	116.38	b
Win	168.87	d	Win	130.35	c

Drying time is not as much as different with the amount of water content. The organ that experience the fastest time of drying respectively is flower, root, leaf, fruit and bark. Drying time is also influenced by the method in drying. In sequence, the effective method which is used is oven, sun & blower, blower, sun and win. A drying method used by oven and sun & blower is not different significantly, but it will be different when it uses blower, sun and win.

On the organs of flower plant, *I. paladusa and S. polyanthum*respectively have more rapidly process in drying. Moreover, on the organs of root plant, the plant which has a rapidly process in drying are *A.fistulosum C.variegatum,* and *S.polyanthum* by sequence, *A. fistulosum, C. variegatum, H. littoralis, C. fructicosa* and *S. polyanthum* on the organs of leaf plant, *S. polyanthum* on the organs of fruit with the fourth place in drying time, and the last place (the longest time of drying) is *S. polyanthum*on the organs of bark.

The time of drying successively influenced by the part of plants organ have been explained that the flower is a part of plants organ which has more rapidly time in drying. Flower is one of the plants parts which have more than 70% water content, soft and easily broken. After passing a drying process or standing it for little long, so the flower pigment will change due to the oxidation reaction. It is easy to be browning because of theenzymatic process. Flower drying will be better done by withering and do not expose directly to the sunlight to obtain a perfect dry flower (Balai Besar Penelitian dan Pengembangan Pascapanen Pertanian, 2010). The next plant organ is root. A root which is used as simplicia material needs to be washed up from all of clay inherent. The characteristic of root aresolid and less brittle. It is due to the water content reach more than 60%. Directly drying process to the sunlight takes a little longer than a mechanical dryer. If the weather is enabled, it is usually make the materials will likely damage because of fungus. Therefore, it will be better if the material is dried by using mechanical dryer. (Balai Besar Penelitian dan Pengembangan Pascapanen Pertanian, 2010).

The next is leaf. A young leaf that is used usually dried slowly due to the water content is higher. Therefore, it may caused an enzymatic reaction which will continue quickly. In addition, a young leaf has a very soft tissue so that it is easy to shatter and damage. Generally, the old leaf will be given a certain treatment in withering process continued to slowly drying process to obtain an interesting color. Drying leaf as simplicia should not have a direct exposed to the sunlight because it will change the chlorophyll compounds of leaf, therefore the product will become less brownish. In using mechanic dryer, the temperature must be controlled in order to make it stable and does not exceed up to 40º C, because in those stable temperature the chlorophyll compounds will not be damaged (Balai Besar Penelitian dan Pengembangan Pascapanen Pertanian, 2010).

The next part of plants is fruit. Water content in fruit is quite higher between 70%-80%. A drying can be done gradually or directly dried by using mats with the evenly thickness and not too thick, using a mechanical dryer or oven in the temperature of 40-50º C. During drying process, it will be good to always be done the reversal in getting a good result of the product (Balai Besar Penelitian dan Pengembangan Pascapanen Pertanian, 2010). The part of plants which has the longest time in drying is bark. A bark has a similar characteristic that is rigid, solid and tough due to a higher content of cellulose fibers, hemicellulose, and lignin (

Balai Besar Penelitian dan Pengembangan Pascapanen Pertanian, 2010). Bark is dried in the sunlight directly or with oven at the temperature of 50º C with the heap thickness 3-4 cm. The process of drying can be done until a bark is completely dry. It marked from the harshness of the wood. The more solid of a wood, it is easier to be broken; the color is cardinal (light red) up to russet (Guidelines for handling post-harvest technology medical plants, 2011).

The Relation between Drying Time of the Water Content and Drying Method

Simplicia is one of the plants which are used as a medicine that never experience any treatment but drying. Simplicia obtained from home-yard and fields, planted or non-planted. The chemicals in simplicia contains of volatile oil, starch (Davy, 1996), an active substance (tannins, alkaloid, saponins, terpenoids, etc). Based on hypothesis testing of water content which is resulted from F count of 68,438 with *p-value* = 0,000. *p-value*< α (α= 0,05) means, there is an influence between drying method toward the result of water content. The differences between drying method toward the water content needs to be done by DMRT testing in the result of Win method produces the greatest number of water content. Water content which is produced in Win method is not different with the Sun method. For both methods significantly produce more water content than the other three methods. Besides, Oven-drying method significantly produces less than the other four methods. Based on the average of water content from the treatment of each types of leaf, it can be seen that *S. polyanthum* produces the greatest number of water content. Whereas, *A. fistulosum*produces a little number of water content. Yet, although there is the difference in the water content for each treatment distinction of leaf, the differences of the water content is not significantly different each other.

Based on the hypothesis, the time of drying resulted from F count as 5,686 with *p-value* = 0,000. *p-value*< α (α = 0.05) means there is an influence in drying method toward the time of drying. The difference of drying method toward the time of drying needs to be done by DMRT testing, resulting that the Win method is the longest time of drying. The time of drying by Win method is significantly longer than the other four methods. In the other hand, oven-drying method needs the fastest time compared with the other four methods. The interaction of Win method on *C. fructicosl*eaf takes more times in drying and it takes a long time from the other interactions. Besides, the oven-drying method on *A. fistulosun* leaf has the fastest treatment compared to other treatment interactions.

Drying is a method that is used to take out the water in the food ingredients by using heat energy. The use of oven drying for a long time will reduce the water content on its ingredient, but it will cause the water content decrease more slowly (Fadilah and friends, 2010). A drying process with the sun is difficult to control. The combination of drying from the sun and blower result the best quality of simplicia rather than dry it by aerating, a drying by the sun or blower only is more quickly. The use of drying method by aerating simplicia still produces higher water content and if it stored in certain period of time, it will cause a damage in physical as well as chemical (Manoi, 2006).

The water content of simplicia is better less than 10.00%. When the water content is more than 10.00%, it will lead the occurrence of enzymatic process and damage by microbes (Manoi, 2006). The longer drying takes place, hence the evaporation of water in the material/ ingredient happen faster and the water content will on the wane (Martunis, 2002). The time of drying will impacts on the number of water content. The longer time of drying, the more water molecule is evaporated (Fitrian, 2013, Aprilia and friends, 2014). A high and low of an ingredient is determined by bound water and free water which is contained ingredients. Bound water requires a higher temperature in evaporation rather than free water which is required lower temperature to let the evaporation (Fitriani, 2013).

CONCLUSION

The whole method of drying is qualified in the water content of simplicia between 6% - 10%. A method of drying is influential significantly towards the water content of simplicia and drying time on the kinds of plants. The longer time of drying hence the water content will

lower on the plant organ that is used as simplicia. Sequentially, the more effective drying method is using combination method sun and blower, blower, oven, sun and wind.

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