Characterization of Dried Centella Asiatica. L (Pegaga) Through Spray Drying

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***Abstract* —- *Centella asiattica* L. Urban within the family of *Apiaceae* is a tropical herb. The plant is native to Southern Asian countries like Asian Pacific country, China, Sri Lanka and several other Southeast Asian countries and is thought by many native other names. *C. asiatica* has been used for many years as ancient medication to cure numerous ailments. In addition, it has been used as a crucial ingredient for cosmetic recipes associated as an antimicrobial agent. For this experiment, the objectives are to observe the possible highest inlet temperature and the optimum condition that could be achieve to dry the *Centella Asiatica*. The physicochemical properties including antioxidant activity, process yield and moisture content. One among the most normally used techniques for drying is spray drying. Maltodextrin is one of the chemicals used for this experiment and acted as carrier in the spray drying method. The spray dryer model used for this investigation is the BUCHI Mini Spray Dryer B-290. The powder will undergoes several test (moisture content, yield, DPPH, TPC, color analysis). The extraction yield shows higher difference gap when there was maltodextrin being used. The results effect the production of the powder as the concentration of maltodextrin varies from time to time. It was observed that DPPH antioxidant activity varies to the temperature at the end of the experiments.**

Keywords—Centella Asiatica, inlet temperature, Maltodextrin, spray drying

I. INTRODUCTION

Centella asiattica L.Urban within the family of Apiaceae (or Centella coriacea Nannfd., Hydrocotyle asiatica L., Hydrocotyle lunata Lam., and Trisanthus cochinchinensis Lour.) is a tropical herb. The plant is native to Southern Asian countries like Asian Pacific country, China, Sri Lanka and several other Southeast Asian countries as well as Thailand, and is thought by many native other names, like Gotu kola, Indian pennywort, Indian water navelwort, Asiatic pennywort, wild violet, tiger herb and marsh penny ship rot. In Thailand, the plant is known as Bua bok. (James & Dubery, 2009). It is also referred to as "*mandukaparni*" in Sanskritic language, "*brahmi*" in Telugu and "*vallarai*" in Tamil. (Gomathinayagam et al., 2015).

Usually in tropical muddy areas, there are grows of *Centella Asiatica*. It can be described that the stems are slender, grassy to reddish-green in color, creeping stolons and it make plants to connect one another. Moreover, with a green, long pedunculate, leaves with kidney-shaped rounded apices with palmate reticulate veins which have sleek texture. The leaves are borne around 2 cm on pericladial petioles. The rootstock growing vertically down consists of rhizomes. The color are creamish and it is coated with root hairs. The pink to red flowers in color, rounded bunches (umbels) close to the surface of the soil and born in tiny. Partially enclosed in two grassy bracts for every flowers. The hermaphrodite flowers with 5-6 ringlet lobes per flower and minute in size (less than 3 mm). There are five stamens and two designs bears for every flower. The fruits commonly are densely reticulate, distinctive from species that have sleek which are Hydrocotyle, ribbed or rough fruit. The maturity are within 3 months, and it is harvested manually for the whole plant including the roots. (N. a Zainol, Voo, Sarmidi, & Aziz, 2008)

C. asiatica has been used for many years as ancient medication to cure numerous ailments like body ache, wound healing, asthma, headache, leprosy, ulcers, insanity, eczemas, tumor and cancer, diabetes, and amnesia. In addition, it has been used as a crucial ingredient for cosmetic recipes associated as an antimicrobial agent. (Niamnuy et al., 2013). Besides, C. asiatica (Linn) Urban or pegaga, (M. K. M. Zainol, Abdul-Hamid, Bakar, & Dek, 2009) has antioxidative property and used for the treatment of biological process disorders, urinary diseases, in Hansen's disease historically. (Gomathinayagam et al., 2015).

In Malaysia, *Centella Asiatica* they are confined more as a traditional vegetable or an 'ulam' among Malays rather than medicinal plant. It is eaten fresh by Malaysian people. However, *Centella Asiatica* is also well-known as a traditional medicinal herb that has been used a lot in Asia Pacific countries and the marketing has been on a rise in the U.S and Europe. This is because the western countries have seen a lot of advantages that can be extracted from *Centella Asiatica* especially on natural remedies. So, the global market shows increasing in demands from year to year for these supplements. According to Oxford-based Global Initiative Chairman, Professor Gerard Bodeker stated that this amazing plant help to increase collagen and fibronectin production leading to improved skin elasticity and youthfulness and enhance brain connectivity.

There are many types of processes can be used to produce dried *Centella Asiatica*. They can be oven drying, freeze drying or drum drying. However, in this study *Centella Asiatica* will be process using spray drying. This is because spray drying is considered as one of the simplest and fastest process compared to others. The costs associated with spray drying also less than freeze drying. We can simply said that *Centella Asiatica* are one of the herbal plants which contains a lot of benefits such as it improves brain function, improves skin quality, good for aids detoxifies and has powerful antioxidant. Therefore, the objectives of this study are to produce dried *Centella Asiatica*. L powder via spray drying and to characterize and compare *Centella Asiatica*. L with commercial *Centella Asiatica*. L powder.

II. METHODOLOGY

A. Materials

Centella Asiatica (L.) or 'pegaga' used in this study was

obtained from Pasar Seksyen 6 Shah Alam. The plant, without any physical damage and injury from insects or fungal infections were selected for this study. Maltodextrin is one of the chemicals used for this experiment and acted as carrier in the spray drying method.

B. Preparation of the extract

The *Centella Asiatica* leaves were disintegrated from stem initially. 30 gram of leaves were weighed and mixed with 150ml of distilled water. The mixture was processed using blender about 6 minutes. The mixture was then sieved to get the extract solution. The extracted solution was kept in room temperature for 2 hours before spray drying.

C. Determination the yield for extracts

The percentages of yield were based on dry weight of sample by using the formula given. Each sample of extracts for *Centella Asiatica* was determined in triplicate.

D. Determination of the total phenolic content (TPC)

The total phenolic contents of the extract solution were determined using the Folin Ciocalteau reagent by Suzanna (2014). Gallic acid was used as a standard for this experiments and standards (200, 300, 400 and 500 mg/l) concentrations were prepared by diluting the stock with distilled water. 30 µl of extract was added into test tube and followed by 1.58 ml of distilled water. 100 µl of Folin Ciocalteau reagent was then added and the mixture was incubated for 2 minutes. After that, 300 µl of sodium carbonate was added and the mixture was mixed thoroughly. Lastly, the mixture was left at room temperature for 2 hours and the absorbance of the samples were measured at 765 nm using spectrophotometer.

E. Determination of DPPH (2,2-diphenyl-1-picrylhydrazyl)

The *Centella Asiatica* powder was weighed 80 mg and being dissolved into 40 ml of methanol. The extracts (1.0, 0.75, 0.5, 0.25 ml) were prepared and methanol was added to the extract solutions. Finally, each samples were mixed with 4 ml of DPPH reagent as the ratio 4:1 to the extracts and left in the dark at room temperature for 30 minutes. The absorbance were measured at 765 nm using spectrophotometer and performed in triplicate.

F. Determination of moisture content of the powder

The moisture content was determined using moisture analyzer at 150ºC for 10 minutes. The readings were recorded every minutes for each samples.

III. RESULTS AND DISCUSSION

Inlet temperature being used in the experiments and maltodextrin added in the extract concentration both had effects on the powders produced.

A. Extraction yield of the powders

Figure 1 shows the extraction yield for *Centella Asiatica*. L. at three different temperature that were conducted in these experiments. Based on the graph, the first part were presented the yield with no maltodextrin for three temperatures (130, 150 and 170ºC). The effects shown no slightly different for the yield if it was increase in temperature. However, when conducted the experiment with maltodextrin, the results came out with drastic value compared to the previous experiments. At 130ºC, the results were 12.53±3.46, 40.76±0.72 and 48.35±1.66. Meanwhile, for 150ºC were 12.60±0.14, 43.71±0.49, 51.05±1.68 and 12.73±1.23, 41.91±1.27, 53.67±0.66 were conducted at 170ºC. Therefore, we can concluded that with the presence of maltodextrin, it helps to increase the reaction to become the powder as the temperature also increase.

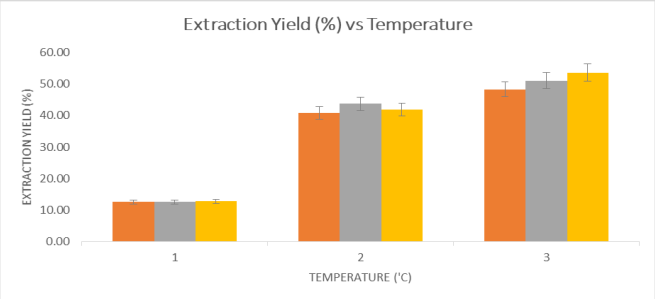

Fig. 1: Extraction yield (%) for Centella Asiatica. L at different temperature with the present of 0%, 5% and 10% of maltodextrin.
( ) represented yield at 130 ºC with 0% (1), 5% (2), 10% (3).
( ) represented yield at 150 ºC with 0% (1), 5% (2), 10% (3).
( ) represented yield at 170 ºC with 0% (1), 5% (2), 10% (3).

John Shi et al. (2003) mentioned in their research by heating up to certain temperature significantly increased the extraction yield compared to extraction in lower temperature. However, the get a better quality of the extract there must be a preferable temperature. (Shi et al., 2003). Other factor could affect the extraction yield was heating time. In this experiment, it is required 15-20 minutes to run the experiment. So that, the results being consistent at the end of the experiments. Moreover, Che Sulaiman et al. (2017) found out that under high temperatures, tissue of the plant are softened and the weak interactions affect the cell membranes. (Soraya et al., 2017)

B. Moisture content analysis

The important part to keep the quality of the powder at the best condition was moisture content. It is stated that when the moisture content was high, it will affected the quality due to the activity of the bacteria. From this experiments, figure 2 displayed the moisture content of the powder against maltodextrin concentration at 150ºC with the mean ± SD (13.58±0.42 mg/l, 8.44±0.20 mg/l, 7.43±0.99 mg/l). As the concentration of maltrodextrin increase during carried out the experiment, the results effect the production of the powder. Overall it was observed that moisture content of the *Centella Asiatica* powder decrease when the maltodextrin concentration increase at constant temperature.

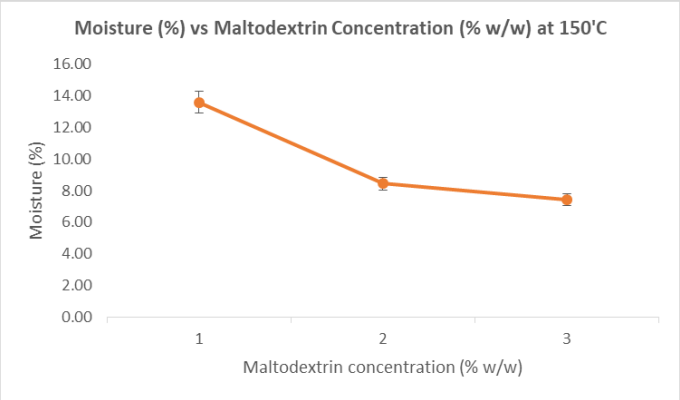

Fig. 2: Moisture content (%) of the powder against maltodextrin concentrations (0%,5%,10%)

In addition, Suzihaque et al. stated that feed of the water content in spray dryer also can be the manipulated variable towards the production of the powder in terms of their moisture content. (Suzihaque, Hashib, & Ibrahim, 2015). However, in this research project the feed was kept constant to obtain the better results at the end of the experiments.

C. *DPPH (2,2-diphenyl-1-picrylhydrazyl) and TPC analysis*

The antioxidant activity of *Centella Asiatica* was determined by measuring its ability to scavenge DPPH free radicals. Rajesh et. al mentioned that extraction temperature help to minimize cost of the process and energy used. Figure 3 and Figure 4 show the effects of extraction temperature on the recovery of antioxidant compounds and activity. The results were expressed as mean ± standard deviation.

It was observed that DPPH antioxidant activity varies to the temperature and it made 130ºC have the drastic depletion among two others temperature with the results 70.49±7.40 µg/ml, 46.06±2.98 µg/ml and 9.20±4.98 µg/ml. The concentration of the extract at 1.0 µg/ml was selected to make the comparison with other temperature at different present of maltodextrin.

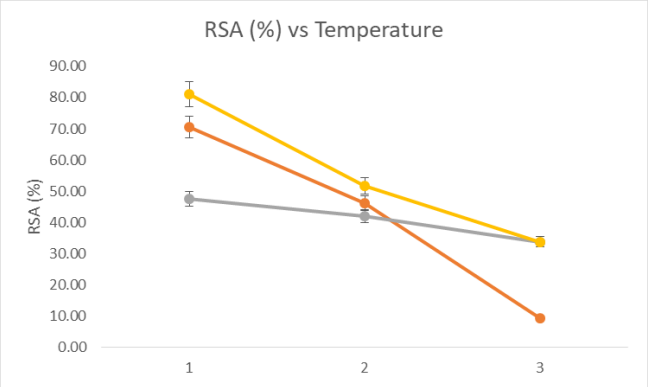

Fig. 3: RSA (%) of the powder against temperature different temperature.
( ) represented RSA at 130 ºC with 0% (1), 5% (2), 10% (3).
( ) represented RSA at 150 ºC with 0% (1), 5% (2), 10% (3).
( ) represented RSA at 170 ºC with 0% (1), 5% (2), 10% (3).

Total phenolic content was determined in terms of mg of Gallic acid equivalent per gram of extracts. The trend shows increment of the absorbance reading as the concentration of the extract increase. For three different temperatures (130ºC, 150ºC and 170ºC), approximately the difference gap was not effected at all however it is found out when the concentration of the Gallic acid increase, the reading of the absorbance also increase.

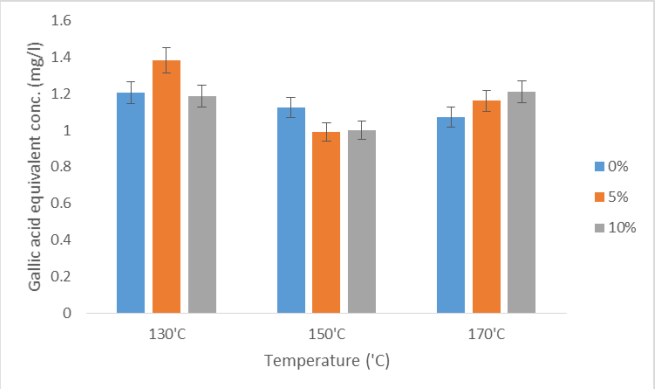

Fig. 4: Effect of extraction solvent concentration on Total Phenolic Content (TPC).

Furthermore, most phenolic compounds were heat sensitive and easily oxidized, hence an upper limit temperature must be observed to preserve its useful component. (Soraya et al., 2017). In this experiment, initially 110ºC was being tested for the spray drying but it resulted gave the poor yield compared to other temperatures. Therefore, none of the analysis can be done for the powder produced at 110ºC. It is possible that the phenolic groups had no effect on the anti-radical activity measured by the DPPH radical scavenging activity assay in the stated region but other groups of antioxidant contributors had an effect. (Soraya et al., 2017)

D. *Color analysis*

Changes in color were measured which expressed color in three numerical notation system as L, a* and b* values. L denotes the lightness and darkness of the color while a* and b* denote hues which represented two color axes with a* the red-green axis and b* the yellow-blue. (Rosalizan, Rohani, Khatijah, & Shukri, 2008). Table 1 and Table 2 show the reading of the color analysis after carried out the experiments. The color appearance, the lightness, redness and yellowness of the powder were affected due to the exposure during spray drying process and the reaction occurs during the process.

The observation shows when the more the presence of the maltodextrin, the color appearance, the lightness, redness and yellowness is more lightness, redness and yellowish and can be seen in the Table 2.

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Inlet air temperature (ºC)	L	a*	b*
130	22.43±0.26	-2.66±0.17	5.51±0.44
150	23.00±0.40	-2.52±0.22	6.03±0.53
170	22.63±0.33	-2.69±0.12	5.77±0.53

Tab. 1: The results for the color analysis with the presented of maltodextrin concentration at 5% w/w

Maltodextrin concentrations (% w/w)	L	a*	b*
0.0	20.27±0.12	-1.05±0.18	3.53±0.15
5.0	23.00±0.40	-2.52±0.22	6.03±0.53
10.0	23.77±0.69	-2.37±0.19	6.64±0.41

Tab 2: The results for the color analysis at inlet temperature (150ºC)

IV. Conclusion

Spray drying is one the simplest process to produce the powder and in this experiment *Centella Asiatica* was being used. The inlet temperature and maltodextrin were manipulated to get the optimum powder produced. With the present of maltodextrin and the higher temperature, spray dryer produced more powder. The extraction yield of the powder increase when there was maltodextrin being used. The moisture content at 10% of matodextrin concentration shows the least value compared to 0% and 5% maltrodextrin concentration. The DPPH and TPC were analysed to minimize cost of the process and energy used.

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