Standardization and phytochemical screening of *Centella asiatica*, *Moringa oleifera* L. leaf and *Spirulina* sp. simplicia

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**Abstract.** *Centella asiatica*, *Spirulina* sp., *Moringa oleifera* have been used for traditional medicine. Studying the phytochemical constituents helps to reveal the usage of plants used as lead compounds for active pharmaceutical ingredients in commercial purposes. This study aims to determine the standardization and screening of phytochemicals from CA, ME and Spirulina. Standardization of CA, ME and spirulina showed as follows: total water 5.29 ± 1.1%; 5.98 ± 0.006% and 8.64 ± 1.16, total water soluble simplicia: 19.7 ± 0.57%; 10.97 ± 0.99 and 10.98 ± 1%, total ethanol soluble simplicia: 22.3 ± 0.57%; 15.99 ± 1.73% and 39.92 ± 1.73%, total ash: 23.11 ± 0.56%; 8.15 ± 0.28% and 8.65 ± 0.28%, total ash insoluble acid: 0.42 ± 0.07%; 2.15 ± 0.28% and 0.66 ± 0.28% respectively. Both simplicia of ME and spirulina contained of alkaloid, tannin, saponin, triterpene/steroid, flavonoid and glycoside whereas CA simplicia contained tannin, saponin, triterpene/steroid, flavonoid and glycoside.

1. **Introduction**

*Centella asiatica* (CA) or widely known as Gotu Kola in the international market or ‘Pegagan’ in Indonesia is known for its bioactive compounds and has been used as a medicinal ingredient to treat various illnesses and diseases [1,2]. *Moringa oleifera* (ME) contained a rich concentration of vital minerals and vitamins that can be used for centuries for the treatment of many diseases such as anti-hyperglycemic and anti-dyslipidemic [3,4]. *Spirulina* sp. has been proven its benefits as antioxidants, antidiabetic and antihypertensive in vitro and in vivo [5].

Considering the broad medicinal effects of these plants, it is important to ensure the quality of standardized simplicia based on the physicochemical and phytochemical screening responsible for biological action. This research is an important starting point for standardization of traditional medicine because only the quality of simplicia is good which produces good quality traditional medicine [6]. Phytoconstituents are the bioactive compound present in the plant. It is responsible for medicinal and biological as well as the toxic activities of plants. Hence, many phytochemicals or secondary metabolites are used as a lead compound for a new medicine or the active pharmaceutical ingredients in the commercial purpose. Hence, studying the phytochemical constituents helps to reveal the usage of plants [7]. This study aims to determine the standardization and screening of phytochemicals from CA, ME and Spirulina.
2. Materials and Methods

2.1. Plant Material

*Centella asiatica* (CA), *Moringa oleifera* (ME) powder leaf and spirulina were purchased from Solo, Central Java, Indonesia.

2.2 Standardization and Phytochemical Screening Procedures

Standardization of both simplicia including determination of total water, total water soluble ash, total ethanol soluble ash and total ash was conducted based on “Materia Medika Indonesia (MMI)” [8]. Qualitative phytochemical screening to trace alkaloida, glycoside, saponin was based on MMI as well, while procedure by Farnsworth [9] was used to identify the presence of tannin, flavonoid, steroida/triterpenoida and glycoside.

3. Results and Discussion

Table 1 showed that the percentage of total water of both CA and spirulina was almost comparable ie 5.29 ± 1.1% and 5.98 ± 0.006% of each, but ME (8.64 ± 1.16%) was higher than CA and spirulina. Total water soluble simplicia of CA (19.7 ± 0.57%) was higher than ME (10.97 ± 0.99) and spirulina (10.98 ± 1%). Total ethanol soluble simplicia of spirulina (39.92 ± 1.73%) was highest, and CA (22.3 ± 0.57%) was higher than ME (15.99 ± 1.73%). Total ash of CA (23.11 ± 0.56%) was also higher than ME (8.15 ± 0.28%) and spirulina (8.65 ± 0.28%). Total ash insoluble acid of ME (2.15 ± 0.28%) was higher than CA (0.42 ± 0.07%) and spirulina (0.66 ± 0.28%).

| Chemical class                  | CA (%)       | ME (%)       | Spirulina (%) |
|---------------------------------|--------------|--------------|---------------|
| Total water                     | 5.29 ± 1.18  | 8.64 ± 1.16  | 5.98 ± 0.006  |
| Total water soluble simplicia   | 19.7 ± 0.57  | 10.97 ± 0.99 | 10.98 ± 1     |
| Total ethanol soluble simplicia | 22.3 ± 0.57  | 15.99 ± 1.73 | 39.92 ± 1.73  |
| Total ash                       | 23.11 ± 0.56 | 8.15 ± 0.28  | 8.65 ± 0.28   |
| Total ash insoluble acid        | 0.42 ± 0.07  | 2.15 ± 0.28  | 0.66 ± 0.28   |

Table 2 showed phytochemical screening of *Centella asiatica* (CA), *Moringa oleifera* (ME) leaf and *spirulina* simplicia includes tannin, saponin, triterpene/steroid, flavonoid and glycoside. Both of *Moringa oleifera* (ME) leaf and *spirulina* simplicia contained alkaloids, tannins, saponins, triterpenes/steroids, flavonoids and glycosides. *Centella asiatica* (CA) contained tannins, saponins, triterpenes/steroids, flavonoids and glycosides, but it has no alkaloids.

| Chemical class                  | CA (−) | ME (−) | Spirulina (−) |
|---------------------------------|--------|--------|---------------|
| Alkaloid                        | (+)    | (+)    | (+)           |
| Tannin                          | (+)    | (+)    | (+)           |
| Saponin                         | (+)    | (+)    | (+)           |
| Triterpene/Steroid              | (+)    | (+)    | (+)           |
| Flavonoid                       | (+)    | (+)    | (+)           |
| Glycoside                       | (+)    | (+)    | (+)           |
Plants are valuable for modern medicine development [10]. The plant is a very source of potentially useful as raw material for traditional medicines. Standardization of medicinal plant under development plays a very important role in identifying its purity and quality [11]. The physicochemical analysis is responsible for ensuring the quality and purity of *Centella asiatica*, *Moringa oleifera* and *Spirulina*. The percentage of total water of both CA (5.29 ± 1.1%) spirulina (5.98 ± 0.006%) and ME (8.64 ± 1.16%) that below 10% were in the normal level. The value of water content showed values less than 10 % that means sample will not allow for microbial growth. Total water soluble simplicia of CA, ME and spirulina are not less than 19.7± 0.57%; 10.97 ± 0.99 and 10.98 ± 1%. Total ethanol soluble simplicia of CA, ME and spirulina are not less than 22.3 ± 0.57%; 15.99 ± 1.73% and 39.92 ± 1.73%. Total ash simplicia of CA, ME and spirulina are not more than 23.11 ± 0.56%; 8.15 ± 0.28% and 8.65 ± 0.28%. Total ash insoluble acid CA, ME and spirulina are not more than 0.42 ± 0.07%; 2.15 ± 0.28% and 0.66 ± 0.28%. Determination of water-soluble concentration and ethanol was conducted to give an early study of the number of compounds that can be dissolved with water solvents and ethanol from a simplicia. Total ash was determined to describe the content of internal and external minerals derived from the initial process until the formation of the extract [8].

Phytochemical screening responsible for biological action. Phytochemical process of the three simplicia was carried out to detect the presence of secondary metabolite such as flavonoid, tannins, terpenoid, steroid, alkaloid, saponins, glycosides using standard phytochemical method by Farnsworth and MMI. This test to indicate the presence of various bioactive secondary product which would be responsible for their common plant attributes. Phytochemicals such as alkaloids, terpenoids, steroids, saponins were processed the standard methods, phytochemical analysis of plant was need to discover and extended to novel therapeutically agents with improved efficiency [12].

The present study identified the presence of following chemical compounds ie alkaloid, tannin, saponin, triterpene/steroid, flavonoid and glycoside in *Moringa oleifera* (ME) leaf and *spirulina* simplicia. In *Centella asiatica* (CA) did not found alkaloids, but found ie tannin, saponin, triterpene/steroid, flavonoid and glycoside. This result supported the previous study that reported the similar compounds were found in both plants.

4. Conclusion

Standardization of CA, ME and spirulina simplicia meets MMI criteria. Both simplicia of ME and spirulina contained of alkaloid, tannin, saponin, triterpene/steroid, flavonoid and glycoside. But CA simplicia contained tannin, saponin, triterpene/steroid, flavonoid and glycoside.

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References

[1] James J and Dubery I 2011 *JPC-J Planar Chromat* 24(1) 82-87
[2] Neube EN, Steenkamp PA, Madala NE and Dubery IA 2017 *Plant Cell Tissue Organ Cult.* 129(3) 431-443
[3] Fatima T, Sajid MS, Jawad-Ul-Hassan M, Muhammad R and Science V 2014 *Applied Life Science* 51(1) 251–262
[4] Stohs SJ and Hartman MJ 2015 *Phytotherapy Research* 29(6) 790–804
[5] Yasir AS, Wiranti MW, Wulantika NW 2019 *Jurnal Farmasi Malahayati* 2(2) 164-174
[6] Ladeska V, Dewanti E, Sari DI 2019 *Pharmacogn J* 11(6) 1256-1261
[7] Lallianrawna S, Muthukumaran R, Ratle V, Gurusubramanian G, Kumar S 2013 *King and H. Rob Act Vis* 13149-56
[8] Ditiens POM 1995 *Materia Medika Indonesia* Jilid VI Departemen Kesehatan RI (Jakarta) p 300-306 321 325 333-337
[9] Farnsworth NR 1996 *Journal of Pharmaceuticals Science* **55(3)** 247-268

[10] Hariharan P and Subburaju T 2012 *Global Journal of Medicinal Plant Research* **1(1)** 10-13

[11] Ahmad T, Singh SB, Pandey S 2013 *International Journal of Pharma Research & Review* **2(12)** 53-60

[12] Thilagavathi T, Doss V, Rajasekar A and Ravichandran D 2015 *International Research Journal of Pharmacy* **6(4)** 246-248