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Evaluation of different locally available medicinal plants at Meerut district of Uttar Pradesh for their chemical composition

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Abstract
Medicinal plants are widely used in various industries like pharmaceuticals, cosmetic, agriculture and food. India is considered as goldmine of herbal medicines and popularly called as 'medicinal garden of the world'. As an estimate, approximately 25,000 effective herbal preparations are used in traditional medicine by more than 1.5 million traditional medicinal practitioners for preventive, promotional and curative applications in India. Among those herbal plants, Giloy/guduchi (*Tinospora cordifolia*), ashwagandha (*Withania somnifera*), lemon grass (*Cymbopogon citratus*), Kalmegh (*Andrographis paniculata*), tulsi (*Ocimum tenuiflorum*), Shatavari (*Asparagus racemosus*), aloe vera (*Aloe vera*), ajooba (*Bryophyllum pinnatum*) and roselle (*Hibiscus sabdariffa*) are important to be mentioned. Though having significant use in medicine and others, these herbs are not much studied scientifically for their biological assessment. All medicinal and herbal plants were collected from the Horticulture Research Centre (HRC) of the university. Then they were dried, grinded and analyzed for dry matter (DM), organic matter (OM), crude protein (CP), ether extract (EE), crude fibre (CF) and total ash (TA). The highest moisture content was found in Aloe vera. This may be due to a good amount of gel present in this plant. Tulsi (*Ocimum tenuiflorum*) was found to contain highest dry matter (49.70%). Aloe vera contained the highest amount of total ash (15.16%) which depicts high mineral content of this plant. Roselle (*Hibiscus sabdariffa*) contained the least ash content (3.04%). Kalmegh (*Andrographis paniculata*) was found to have the highest protein (18.32%) and Shatavari (*Asparagus racemosus*) was the lowest (2.56). The fat content was the highest (12.04%) in Kalmegh (*Andrographis paniculata*). More fibre content (55.32%) in giloy (*Tinospora cordifolia*) makes it unsuitable for animal feed supplementation though it contains a good amount of protein and minerals. From this study, it may be concluded that medicinal plants contain important nutrients and minerals that are useful for human as well as animal health.

Keywords: Medicinal plant, Tulsi, Kalmegh, Shatavari, chemical composition

Introduction
Medicinal plants are widely used in various industries like pharmaceuticals, cosmetic, agriculture and food (Nasreen *et al*., 2010; Nair *et al*., 2012; Mahima *et al*., 2013) [12, 11, 9]. Rigveda, which was written between 4500-1600 BC is the first record of use of herbs or plants as medicine. India has a wide biodiversity including the rich botanical wealth and considered as goldmine of herbal medicines and popularly called as 'medicinal garden of the world' (Archana *et al.,* 2011; Mahima *et al.,* 2012; Dhama *et al*., 2013) [4, 8, 6]. As an estimate, approximately 25,000 effective herbal preparations are used in traditional medicine by more than 1.5 million traditional medicinal practitioners for preventive, promotional and curative applications in India. Among those herbal plants, Giloy/Guduchi (*Tinospora cordifolia*), Ashwagandha (*Withania somnifera*), Lemon grass (*Cymbopogon citratus*), Kalmegh (*Andrographis paniculata*), Tulsi (*Ocimum tenuiflorum*), Shatavari (*Asparagus racemosus*), Aloe vera (*Aloe vera*), Ajooba (*Bryophyllum pinnatum*) and Roselle (*Hibiscus sabdariffa*) are important to be mentioned. Though having significant use in medicine and others, these herbs are not much studied scientifically for their biological assessment. Thus, present study was conducted to assess the nutritional content of above said herbs by proximate analysis.

Materials and Methods

Plants with medicinal importance i.e. Giloy/Guduchi (*Tinospora cordifolia*), Ashwagandha (*Withania somnifera*), Lemon grass (*Cymbopogon citratus*), Kalmegh (*Andrographis paniculata*), Tulsi (*Ocimum tenuiflorum*), Shatavari (*Asparagus racemosus*), Aloe vera (*Aloe vera*), Ajooba (*Bryophyllum pinnatum*) and Roselle (*Hibiscus sabdariffa*)

were collected from different regions of Meerut district in Uttar Pradesh. They were dried, ground and analyzed for dry matter (DM), organic matter (OM), crude protein (CP), ether extract (EE), crude fibre (CF) and total ash (AOAC, 2000) [3]. Standard statistical method will be applied to calculate the average value of each proximate principle (Snedecor and Cochran, 1994) [4].

| Giloy (*Tinospora cordifolia*) | Ashwagandha (*Withania somnifera*) | Roselle (*Hibiscus sabdariffa*) | Ajooba (*Bryophyllum pinnatum*) | Kalmegh (*Andrographis paniculata*) |

| Shatavari (*Asparagus racemosus*) | Aloe vera (*Aloe vera*) | Tulsi (*Ocimum tenuiflorum*) | Lemon grass (*Cymbopogon citratus*) |

Result and Discussion

The proximate compositions of above said medicinal plants are depicted in Table 1. The highest moisture content was found in Aloe vera. This may be due to a good amount of gel present in this plant. Tulsi (*Ocimum tenuiflorum*) was found to contain highest dry matter. Aloe vera contained the highest amount of total ash which depicts high mineral content of this plant. Whereas, roselle (*Hibiscus sabdariffa*) contained the

least mineral matter. Kalmegh (*Andrographis paniculata*) was found to have the highest protein and Shatavari (*Asparagus racemosus*) was the lowest. The fat content was the highest in Kalmegh (*Andrographis paniculata*). More fibre content (55.32%) in Giloy (*Tinospora cordifolia*) makes it unsuitable for animal feed supplementation though it contains a good amount of protein and minerals.

Table 1: Average values of proximate principles of different medicinal plants

Medicinal plant	Proximate principle				
	Moisture%	Total ash%	CP%	EE%	CF%
Tinospora cordifolia	70.92	9.04	7.54	0.98	55.32
Withania somnifera	59.16	8.64	4.20	0.34	35.54
Cymbopogon citratus	64.13	7.86	3.89	4.78	9.43
Andrographis paniculata	57.68	7.69	18.32	12.04	6.57
Ocimum tenuiflorum	50.30	3.69	6.47	6.86	3.89
Asparagus racemosus	63.81	7.88	2.56	0.13	2.54
Aloe vera	89.45	15.16	10.45	1.89	12.50
Bryophyllum pinnatum	84.79	11.54	5.47	1.29	6.45
Hibiscus sabdariffa	64.80	3.07	5.12	0.98	12.45

The findings in the study are similar with the results obtained by Akande *et al.,* (2012) [2]. Protein in Kalmegh is nutritionally significant in food as a source of amino acids in the diet of man, and also plays a part in the organoleptic properties of foods (Orech *et al.,* 2005) [13]. It is an essential

food component needed in our bodies to repair, regulate and protect itself. In addition, essential body processes such as water balancing; nutrient transport and muscle contractions require protein to function properly, while it is also required for the formation of enzymes and hormones. It also aids in the

formation of antibodies that enable the body to fight infection (Brosnan, 2003) [5]. On the other hand, protein deficiency causes growth retardation, muscle wasting, oedema, abnormal swelling of the belly etc. (Murray *et al.,* 2000) [10]. The appreciable amount of protein in the seed sample is an indication that it can be used for the building and repairing of body tissues, regulation of body processes and formation of enzymes and hormones, and also to produce antibodies that enable the body to fight infection, apart from serving as a major energy supplier (Brosnan, 2003) [5].

Hussain *et al.* (2009) [7] reported that giloy (*Tinospora cordifolia*) contains 13.32% crude protein, 23.30% fibre and 1.99% fat. In recent years, there is an increasing interest for quality control in research and production of medicinal plants particularly those of imported or raw materials procured from traditional herbal producers (Nasreen *et al.,* 2010) [12]. Proximate and elemental analysis helps us in determining the nutritive value of the medicinal plants. The crude protein composition of a plant is of great value due to its nutritive values (Ajibade and Fagbohun, 2010) [1]. Hussain *et al.* (2009) [7] also reported the high concentration of protein (13.32%) in this plant. This precludes that the *Tinospora cordifolia* could be a rich source of nutrition for body building and boosting the immune response.

Conclusions

Recently, there is an increasing interest in use of herbal or plant products for treatment and preventive purposes. Earlier medicinal plants were used by indigenous and marginal communities for treating different diseases. The present study is an effort to know the biological properties of plants by proximate analysis. From this study, we observed that medicinal plants contain important nutrients and minerals that are useful for human as well as animal health. Furthermore, a thorough research would be helpful to further investigate the anti-nutritive, enzymatic and molecular effect on human as well as animal health of this plant.

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