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Physicochemical characterization of *Nigella sativa* L. and *Allium cepa* L. seeds

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Abstract
The core aim of this paper is to report the isolation and characterization of *Nigella sativa* L. and *Allium cepa* L. seed oil. The oil extraction was done by the Hydraulic press. The hydraulic press is equipped with a hydro-electric power connected to a jack screw which compresses the sample inside a metallic cylinder surrounded by a resistance controlled by a thermostat. The oil yield was the ratio between the mass of oil extracted and the mass of the sample. The viscosity of *Nigella sativa* L. and *Allium cepa* L. was 28.32±0.56 and 21.36±1.06 respectively. The Specific gravity of *Nigella sativa L.* and *Allium cepa L*. was 0.83±0.19 and 0.61±0.92. The Acid value of *Nigella sativa L.* and *Allium cepa L.* was 3.05±1.63 and 2.73±2.11. The % free fatty acid, saponification values, unsaponification values and peroxide value of oil was also computed. The present work carried out to suggest exploring of title plants for chemical constituents and pharmacological action.

Keywords: *nigella sativa* L. *allium cepa* L. oil physico-chemical characterization

Introduction
Nigella sativa L. (Black seeds) taxonomic classification depicts that it is a flowering; dicotyledon plant which belongs to family Ranunculaceae under kingdom plantae. Morphologically *N. sativa L.* is an annual medicinal herb, about 30-60 cm high with finely divided, linear leaves (Blatter *et al.*, 1984) [8]. The flowers are usually pale blue and white, with 5-10 petals. The fruit is a large inflated capsule (Prain, 1988; Mozzafari *et al*., 2000) [20, 17]. The stem is green, round, hairy, 2-5 mm diam., leaves alternate, pinnate, lower leaves small, upper leaves sessile, 6-10 cm long, flowers regular bisexual, terminal on branches, white, yellow, pink, pale blue or pale purple.The different parts of the plant are used for medicinal purposes (Salem and Hossain, 2000; Salem, 2005) [22, 23]. Th cultivation of *Nigella sativa L.* traced back more than three thousand to the kingdom of the Assyrians and ancient Egyptian. The black seeds possess antimalarial, antibacterial, anthelmintic, insecticidal, antifungal and antitumor properties. There are also findings that black seeds are bestowed by diuretic, carminative, digestive and antiseptic effects (Burits & Burcar, 2000; Morsi, 2000; Teicher, 2002; Ali & Blunden, 2003; Saleh, 2006; Abdulelah & Abidin, 2007; Ahmad & Ghafoor, 2007; Ali *et al*., 2008) [10, 16, 25, 4, 21, 1-3]. *Allium cepa L.* called bulb onion or common onion, belongs to the family Alliaceae or Amaryllidaceae which is one of the most important monocotyledonous crops. The green stems and Leaves are hollow and can reach 3 ft (1m) in height (Farooqi and Kumar, 2003) [13]. Leaves consist of two main parts: a sheathing leaf base and a hollow, linear, semicylindrical and flattened blade. It grows up to 40 cm long and up to 1 cm in diameter. Roots are shallow and fibrous. Bulbs are clustered, cylindrical to ovoid or almost rounded; coats papery, white to brownish or reddish. Scape up to 1 m tall, stout, fistular, usually inflated below the middle.

Flower inflorescence is an umbel, 3–5 cm in diameter. It is an aggregate of many smaller inflorescences of 5 to 10 flowers each. Within each of these small cymes of inflorescence, the flowers open in a definite sequence and with a considerable delay between successive flowers. Ovary is superior, subglobose, with concave nectaries covered by hoodlike projections at base (Peffley and Orozco-Castillo, 1987) [19].
Throughout history, onions have been used in folk medicine for purposes ranging from treating wounds and stomach ailments to treating infertility. Experimental studies have shown that the consumption of onion reduces blood pressure, stimulate haematopoiesis, heals heart and blood vessels, helps in treatment of asthma, and protects against some types of cancer. Scientific and pharmacological studies have found that onions or their derived compounds have antimicrobial and antifungal properties, and may also be of benefit in preventing or treating heart disease and atherosclerosis, diabetes, cancer, and possibly asthma (Brewster, 1994) [9]. In the present study oil from the seeds of *Nigella sativa L.* and *Allium cepa L*. was evaluated for the physicochemical characteristics.
Study of various physicochemical characteristics explore the practical importance of herbal oils in our daily life. Physicochemical properties of oil like viscocity, specific gravity, acid value, saponification value etc. indirectly effect the quality of oils. The commercial significance of oils mostly depends on these physiochemical properties which provide basel line data to determine its suitability for consumption (Bamgboye and Adejumo, 2010; Parthiban *et al*., 2010) [7, 18]

Materials and Methods
Collection and authentication of plant material
The mature seeds of *Nigella sativa* L. and *Allium cepa* L. were purchased from the local market of Bhopal Madhya Pradesh, India and were identified and authenticated by Dr. SS Khan,

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Extraction of Oil: The hydraulic press is equipped with a hydro-electric power connected to a jack screw which compresses the sample inside a metallic cylinder surrounded by a resistance controlled by a thermostat. A thermocouple is installed in this press for the recording of the temperature value inside the ground seeds. Oil extraction is carried out from 600 g of ground seeds of *Nigella sativa* L. and *Allium cepa* L. packed separately in cloth; steel plates were placed between each pair of cloth. The ground sample is compressed at various pressures 120 bars and temperatures 60 °C. The oil yield was the ratio between the mass of oil extracted and the mass of the sample.

The viscosity of seed oil was determined using Brookfield DV-I with a spindle of S00 at 100 rpm at room temperature (Fig 1).

Specific gravity was determined according to the Association of Official Analytical Chemists (AOAC) method No. 40.1.08 (1990). A 25 mL specific gravity bottle was used. The bottle was weighed (W0) and then filled with oil, a stopper inserted and then reweighed to give W1. The oil was substituted with water after washing and drying the bottle and weighed to give W2. The specific gravity was calculated from the following equation:

$$\text{Specific gravity} = \frac{(W1 - W0)}{(W2 - W0)}$$

The acid value of oil was determined according to AOAC method No. 940.28. The oil sample (2 g) was dissolved in 10 mL ethanol and titrated with 0.1M NaOH solution using phenolphthalein indicator until the pink color disappeared. The acid was calculated from the function below:

$$\text{Acid Value} = \frac{56 \text{ X Molarity of NaOH X Titration volume}}{\text{Weight of sample (gm)}}$$

The percentage of free fatty acids in the oil was determined by using the AOAC method No. 940.28 and were calculated using linoleic acid as the factor. The percentage fatty acid was calculated from the function below:

%free fatty acid as oleic acid = 0.503 x acid value

Saponification value was determined according to the AOAC method No. 920.160. The unsaponification value was determined according to the AOAC method No. 933.08. The peroxide value (PV) was determined according to the AOAC method No. 965.33 (Tan and Che Man 2000; Janporn *et al.*, 2015) [24, 15]

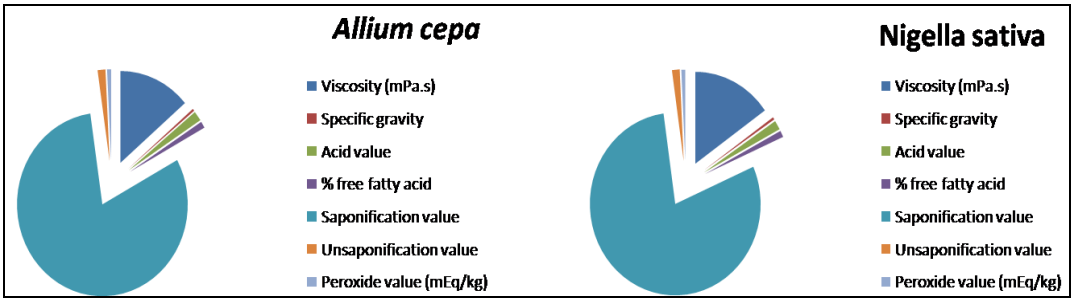

Fig 1: Physicochemical Characteristics of *Nigella sativa* and *Allium cepa* oil Values are mean ± SEM of triplicate determinations

Results and Discussion

Study of various physicochemical characteristics explores the practical importance of herbal oils in our daily life. Physicochemical properties of oil like viscosity, specific gravity, acid value, saponification value etc. indirectly affect the quality of oils. The commercial significance of oils mostly depends on these physiochemical properties which provide Basel line data to determine its suitability for consumption.

The acid value of oil is dependent on the amount of free fatty acids present or on the degree of hydrolysis of the oil. Acid value of oil suitable for edible purposes should not exceed 4 mg/g (Esuoso and Odetokun, 1995) [12]. The acid value of *Nigella sativa* and *Allium cepa* seed oil shows a comparatively low value due to its low content of free fatty acid. The results indicated that acid, free fatty acid, and the saponification value of *Nigella sativa* and *Allium cepa* were acceptable levels based on the standard for edible oils. Saponification value is inversely proportional to the mean molecular weight of the fatty acid in the glyceride present in the lipid (Egan, 1976) [11]. The saponification number of *Nigella sativa* and *Allium cepa* seed oil showed a significantly high number, suggesting that *Nigella sativa* and *Allium cepa* oil contains a high proportion of fatty acids of low molecular weight. The saponification values of *Nigella sativa* and *Allium cepa* oil was comparable to that of sunflower, and corn oil, which have average saponification numbers ranging between 191 mg KOH/g oil and 250 mg KOH/g oil (Babalola and Apata, 2011) [6]. However, the *Nigella sativa* and *Allium cepa* seed oil showed a low unsaponifiable matter. Unsaponifiable matter includes the higher aliphatic alcohols, sterols, pigments, and hydrocarbons. These are substances frequently found dissolved in fatty acids.

Peroxide value is a measure of the reaction rate of lipid oxidation, which causes rancidity. Normally, oils become rancid when the peroxide value ranges from 20.0 mg/g oil to 40.0 mg/g oil. The peroxide value of *Nigella sativa* and *Allium cepa* oil was lower; however, the peroxide values of both oils are below the maximum acceptable value of 10 mEq KOH/g set by the Codex Alimentarius Commission for oil seeds (FOI, 2001). Hence the oil of *Nigella sativa* and *Allium cepa* are edible and nutritive properties cannot be destroyed during storage.

Conclusion

The WHO has recognized the contribution of traditional health care in tribal communities. It is very essential to have an appropriate documentation of medicinal plants and to know their potential for the improvement of health care system via an eco-friendly system. Therefore importance should be given to the potentiality of studies as these can provide a very effective strategy for the discovery of useful medicinally active identity.

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