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PROXIMATE ANALYSIS OF *SESBANIA BISPINOSA* SEEDS

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ABSTRACT

Oil was extracted from the seeds of *Sesbania bispinosa* by soxhlet apparatus using *n*-hexane as a solvent. The oil yield was 6.0%. The proximate analysis of *Sesbania bispinosa* seeds showed that it contained 6.24% moisture, 11.21% fiber, 3.81% Ash, 29.41% protien, 54.54% Carbohydrates, 4.70% Nitrogen and 93.79% total solids. The Gross Energy content of seeds of *Sesbania bispinosa* was 16.3kJ/mol. The nitrogen free extract of seeds was 43.33%. Mineral's analysis of seeds was carried out by Atomic Absorption Spectroscopy. The study revealed that it contained 110.38 mg/100g Sodium, 830.21mg /100g Potassium, 211.26 mg/100g Magnesium, 8.01 mg/100g Iron and 4.79 mg/100g Zinc. It was concluded that *Sesbania bispinosa* seed oil is useful in cosmetics and soap industry.

KEYWORDS: *Sesbania bispinosa*, Fat, Fiber, Protein, Minerals, Zinc, Magnesium, Potassium.

INTRODUCTION

In Pakistan and India it is commonly known as jantar and dhaincha. Manila agath and new dhaincha are the trivial names of *Sesbania bispinosa* in Nepal. People in Thailand called it as girkhe dhaichaa. 'Sano' is a nickname given by Africans. In Orissa it is recognized as Banicha. Indonesians use Kayu ambun for it (Grosvenor et al., 1995). *Sesbania aculeate and*

*Coronella aculeate are synonyms of Sesbania bispinosa (*Misra & Siddiqi, 2005). The morphology of *Sesbania bispinosa* under scanning electron microscope (SEM) showed that the seeds are cylindrical to cylindric-oblong in shape and seed length varies from 2 to 5 mm. Seed color of *Sesbania bispinosa* is olive-green, pale brown or greenish-black (Chanda et al., 2018).

Maximum species of *Sesbania bispinosa* are fragile and grow in agricultural field, wastelands and wet ditches along roads. The habitats of *Sesbania* species include marshes and riverine jungles, wet margins of ponds and canals and sometimes forests and grasslands, seasonally flooded valleybottoms and riverbanks (Ndungu et al., 1994). It's a low-growing, erect annual shrub with thick stems. The height of this shrub can reach up to 1-2meter and above. The stems yield a strong, long-lasting fiber that is utilized in the paper industry (Pugalenthi et al., 2004). In South Africa, it is planted as a green manure (providing 150 kg N /hec).

It is stable at higher temperatures ranges i.e., 36-44°C and high soil alkalinity ranges of pH i.e 10(Khan & Zaki, 2019). It grows well in un-irrigated and waterlogged conditions (Anita et al., 2009). In tropical and subtropical regions there are 50 natural species of the genus *Sesbania* (Swami et al., 2012). *Sesbania bispinosa* is a reportedly common *Sesbania* weed in various tropical countries (Kamoshita et al., 2014). The plant contains anti-oxidant compounds therefore precisely used in cosmetics and pharmaceutical industries. (Larkem et al., 2021)**.**

The current study was designed to investigate the chemical constituents of seeds of *sesbania bispinosa*. Fat, fiber, proteins, minerals etc will be determined by using standard procedures.

MATERIALS AND METHODS

Oil Extraction

Seeds of *Sesbania bispinosa* were collected, washed, spread on the paper and allowed to dry under fan. After drying, the seeds were transfer to domestic grinder and were ground to powder. In soxhlet extractor about 100 g of powdered seeds were extracted with 0.5 L of *n*-hexane until the green color of seeds fainted and the colorless hexane returned to the round bottom flask. For the entire duration *n*-hexane condensation speed was fixed. After extraction the distillation recovers the hexane from the oil. After that the pure solvent was collected in an extractor and remove cautiously. The extracted oil was then dried using anhydrous Na_2SO_4 (Parveen & Rauf, 2008). Oil % yield was calculated using formula. (Pant et al., 2011; Warra et al., 2011).

Proximate Analysis

The method described by Association of official Analytical Chemists AOAC (2006) was used to determine moisture, ash crude fiber, crude lipid and crude protein present in *Sesbania bispinosa* seeds.

Total carbohydrate was determined by method of difference using formula (Hassan et al., 2008) "Carbohydrate Content=100- (fiber content +ash content +protein content +moisture content).

The energy value was determined by multiplying the mean values of total carbohydrate, crude protein and crude fat with 4, 4 and 9 respectively. (Onyeike and oguike, 2003).

Energy value=(Crude Fat%×9)+(Crude Protein% ×4)+(Crude Carbohydrate % ×4) Nitrogen free extract was calculated using formula (Mortuza et al., 2009).

Nitrogen Free Extract=100-(Crude protein+Crude fiber+Crude lipid +Ash).

Mineral Analysis of *Sesbania bispinosa* Seed Flour

Two gram grinded seeds of *Sesbania* were ashed at 400C for 24 hours (to avoid the decomposition of some minerals). After that the ash was dissolved in1N. HNO_3. The mixture was filtered in measuring flask and then was diluted with 1N HNO_3 to 100 mL except for magnesium. For determination of magnesium, the sample was further diluted. For this purpose, 0.5 mL of original solution was taken in 100 mL volumetric flask and then diluted by deionized water up to the mark. For each sample, the blank was also prepared. The sample and blank were then directly run in the atomic absorption spectrophotometer. Stock standard solutions were used to prepare working standard solutions in 1N nitric acid of specific minerals. The absorbance of sample solution followed by working standard solution was then noted in AAS.

RESULTS AND DISCUSSION

Oil extraction and Fatty acids composition of *Sesbania bispinosa* seed oil

The seeds were collected from the local market in Lahore, washed, grinded and oil was extracted using soxhlet apparatus. The oil yield was 6%. *n*-hxane as a solvent was used to extract the oil.

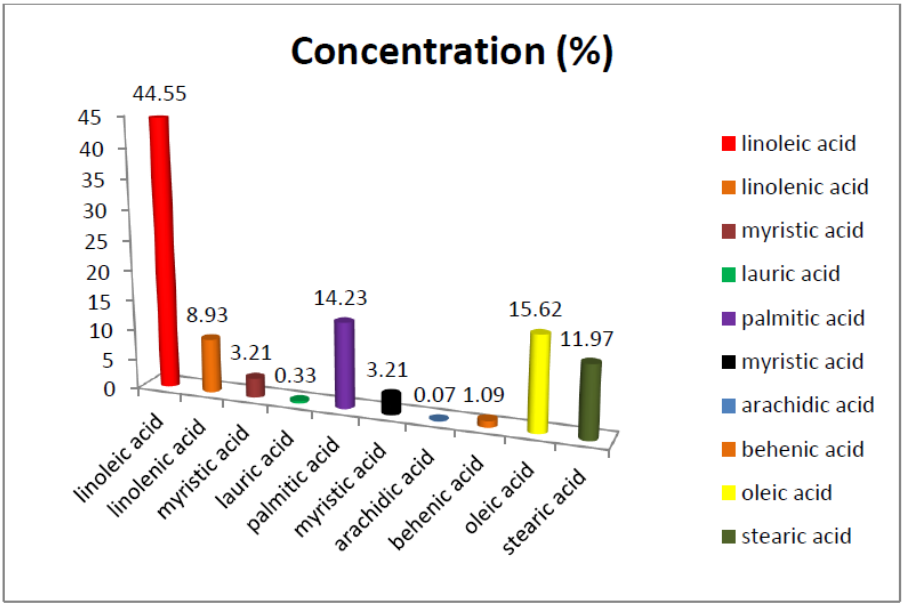

Figure 1: Percentage concentration of fatty acids of *Sesbania bispinosa* seed oil.

The sample was sequentially extracted with 1.25 percent H_2SO_4 and 1.25 percent NaOH to determine the **crude fiber** content (Hassan & Umer, 2004). Filtration was used to collect the insoluble residue. Hemicelluloses, hydrocolloids and pectins, were solubilized therefore could notbe detected whereas, varying level of cellulose and lignin in the sample was quantified.

The crude fiber calculated was 11.21g/100g.

A muffle furnace was used to incinerate the waste. The ash content of *Sesbania bispinosa* seeds was 3.81. Oven drying procedures was used to determine the moisture content of seeds. Temperature was maintained at $102C^{o}$. Moisture content of seed sample was 6.24%. Total solids represented the dry substances that remain after moisture has been removed. Total solid of *Sesbania bispinosa* seeds were 93.76g/100g.

Table 3: Proximate analysis of *Sesbania bispinosa* seed flour.

Sr. No.	Test Parameters	Values(g/100g)
1	Total solid	93.79
2	Crude fiber	11.21
3	Crude fat	6.0
4	Moisture content	6.24
5	Ash content	3.812
6	Nitrogen content	4.70
7	Crude protein	29.41
8	carbohydrates	54.54

9	Soluble starch	-ve
10	Nitrogen free extract	43.33
11	Gross energy	16.30 kJ/g

The nitrogen content and protein content of *Sesbania bispinosa* was determined and calculated bykjeldahl method. The nitrogen content of *Sesbania bispinosa* seeds was 4.70 and then crude proteincontent was determined by multiplying nitrogen content i.e. 4.70 with 6.25. After proximate analysis it was found that the seeds of this plant contain 29.41g/100g protein in it. This showed that the seeds of *Sesbania bispinosa* are a rich source of protein.

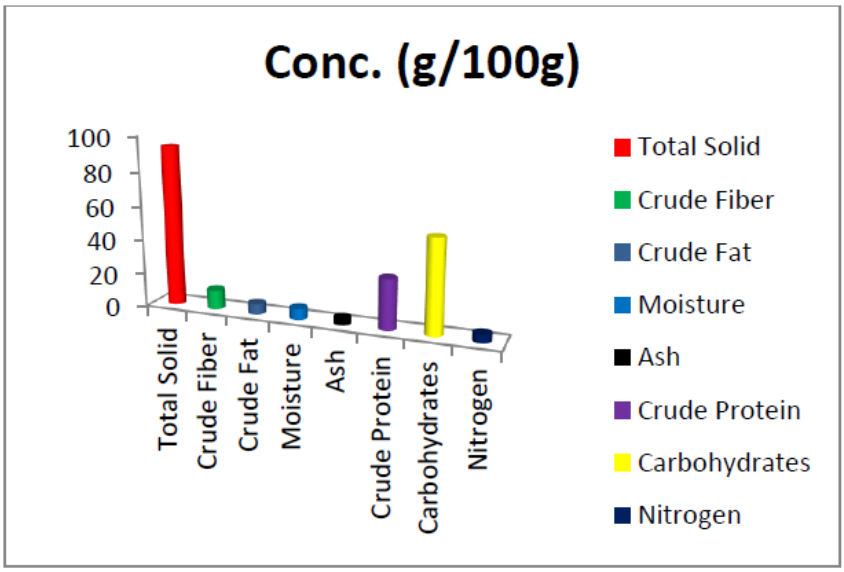

Figure 6: Proximate analysis of *Sesbania bispinosa* seed flour.

The nitrogen free extract of the seeds was calculated after the determination of protein, fat, fiber, moisture and ash contents by just using a formula. The value of nitrogen free extract was 43.33g/100g. Crude energy of the seeds was also determined using formula Energy value=(crude fat%×9)+(crude protein% ×4)+(crude carbohydrate % ×4).

The value was 16.30kJ/g. This means that one gram of *Sesbania bispinosa* seeds can provide 16.3kJ energy. The value predicted that seeds are good source of energy.

Table 4: Mineral Analysis of *Sesbania bispinosa* Seed Flour.

Sr. No.	Mineral	Concentration (mg/100g)
1	Sodium	110.38
2	Potassium	830.21
3	Magnesium	211.26
4	Iron	8.01

5	Zinc	4.79

Minerals are the materials that remain as ash after plant and animal tissues have been incinerated. Minerals play an important part in our bodies, performing essential processes such as making strong bones and sending nerve signals, all of which contribute to a healthy and long life. The presence of a number of minerals not only allows for the production of various hormones, but alsoallows for the regulation of normal heartbeat. Potassium, iron, zinc and sodium and magnesium were determined using Buck 200 Atomic Absorption Spectrophotometer and then compared their absorption with absorption of standards of these minerals. Mineral contents of *Sesbaina* seeds were analyzed according to association of official analytical chemists AOAC, 2006 methods. The sodium content in current study came out as 110.38mg/100g. The potassium content in current study came out as 830.21mg/100g. The magnesium content in current study was 211.26 mg/100g. Mg is an essential biological element that is found in cells in a bound form. It is also the most abundant divalent cation in living cells, and it has numerous important tasks in regulatory cellular functions. Mg fulfils its task primarily through its binding to organic substances, such as proteins, nucleic acids, and nucleotides.[30]

The essential trace element Zn is crucial for many physiological processes in humans, and it is oneof the most frequently studied factors in nutrition and health. It plays elementary roles as a regulator or coenzyme of more than 300 enzymes.[31]

CONCLUSION

The current investigation revealed that the oil yield of *Sesbania bispinosa* seeds was 6.0%. The seed flour of *Sesbania bispinosa* contained 6.24% moisture, 11.21% fiber, 3.81% Ash, 29.41% protien, 54.54% Carbohydrates, 4.70% Nitrogen and 93.79% total solids. The Gross Energy content of *Sesbania bispinosa* seeds was 16.3kJ/mol. The nitrogen free extract of seeds was 43.33%. Minerals analysis study revealed that the seeds contained 110.38 mg/100g Sodium, 830.21mg/100g Potassium, 211.26 mg/100g, Magnesium, 8.01 mg/100g Iron and 4.79 mg/100g Zinc. Moreover the proximate analysis of *Sesbania bispnosa* seed flour also revealed that the seeds are rich source of protein and carbohydrates. Keeping in view of the results, it can be concluded that seeds be used a feed for animals.

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