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BIOCHEMICAL COMPOSITION AND VARIATION OBTAINED IN THE LINSEED CAKES OF IMPORTANT GENOTYPES OR STRAINS

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ABSTRACT

Three different colour varieties of linseed have been studied for a comparative data analysis, results of this study provides valuable information regarding the fifty genotypes of linseed seeds which were grown in Department of Genetics and Plant Breeding. Department farm of SHIATS in year 2011-2012. The seeds were collected and brought into the biochemistry laboratories for biochemical investigation. The fifty genotypes were divided into three different colours, which was fawn, yellow and brown seeded varieties. The oil was extracted from fifty different varieties/strains of linseed seeded coloured varieties. Various biochemical parameters were analyzed in these studies that are percentage of oil content. The cake content was analyzed for protein, lysine, tryptophan, methionine and total ash by using standard methods. Among these three different colour linseed varieties fawn seeds contain the higher percentage of oil. Variation in biochemical constituents in three colour linseed varieties was observed in the range of 36.47-38.85% of oil. 31.69-36.21% for protein, 1.14-1.17% for Lysine, 0.43-0.48% for Tryptophan, 0.27-0.29% for Methionine, 5.76-5.94% for Ash content. The result indicates among the linseed three colour varieties yellow seeds varieties gave better performance as compare to the other genotypes of fawn and brown ones. Therefore, proximate biochemical composition of varieties helps to assess its nutritional and edible value in terms energy units compared to other varieties of linseed seeds.

KEY WORDS: Linseed, oil, protein, lysine, methionine, tryptophan, ash content.

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INTRODUCTION

Linseed (also known as flaxseed) is an important oil crop cultivated worldwide for oil and fiber; Flaxseed/linseed is the annual cultivar of *Linum usitatissimum* is a member of the Linaceae family that includes ten genera and more than 150 species [1]. Approximately 200 species of Linum are known, it has been cultivated in more than 50 countries. Canada is the major linseed producer, followed by China, United States and India [2]. Linseed contains about 36–40% of oil, generally used for the manufacture of paints, varnishes, inks, soap, *etc* [3, 4]. However, in recent time, linseed oil has becoming more popular as functional food in the health food market because of their reported health benefits and disease preventive properties on coronary heart disease, some kinds of cancer, neurological and hormonal disorders [5, 6]. Most of the observed health benefits and disease preventive properties of linseed oil have been attributed to their omega-3 fatty acid, linolenic acid (ALA, 18:3) content. Linseed oil is the richest source of ALA, which makes about 55–60% of total fatty acids [7]. However, this high content of omega-3 fatty acid makes linseed oil highly sensitive to heat, oxygen and light [8].

MATERIALS AND METHODS

The present investigation was conducted at the Department of Biochemistry and Biochemical Engineering, JSBB, SHIATS Deemed-to-be-university, Allahabad and Central Drug Research Institute, Lucknow.

Plant material

Botanical Name	Name	Family	Part Used
Linum usitatissimum	Linseed, Flax, Alasi, Tisi	Linaceae	Seed, Stem

Sample preparation

Fifty genotypes of linseed seeds which were grown in Department of Genetics and Plant Breeding, Department farm of SHIATS in the year 2011 and 2012. The seeds were collected and brought into the biochemistry laboratories for biochemical investigations. The fifty genotypes were divided into three different colours, which was fawn, yellow and brown seeded varieties. The samples were analyzed various biochemical parameters percentage of oil, protein, lysine tryptophan, methionine, and total ash was analyzed by standard methods.

Biochemical Analysis

Determination of Protein by Lowry's Method

The Lowry's reaction for protein estimation is an extension of the biuret method. The method developed by Lowry [9]**.** A 10% (w/v) homogenate of samples was prepared in DW, centrifuged and the supernatants were used for protein estimation. Added 4ml of alkaline copper solution to 0.1ml of supernatant mix it well and incubated at RT for 10 min. After that 0.4mL of FCR was added and after 30min of incubation at RT, absorbance was read at 720nm. A standard was prepared using different concentrations of BSA.

Fat Content

Soxhelt method (AOAC, 1970)[10] was used for the estimation of fat. Accordingly, 5 g dried sample was taken in a Soxhlet flask and about 40 ml petroleum ether (b.p. 40-600C) was add to it. This was then refluxed for 7-8 hrs. Thereafter the traces of petroleum ether were removed from the flask by keeping it in an oven at 1050C for 30 minutes. Fat was expressed as percent on dry weight.

Total Ash Content

Total ash content was estimated with method as described by Hart and Fisher [11]**.** 1 g dried sample which was dried at 700C temperature was transferred to ash less filter paper. The ignition of sample was carried out on non

luminous flame in pre weighed silica crucible. The crucible was placed in to muffle furnace maintained at 525- 550^{0}C for about 5-6 hours to density the organic matters. After expiry of period, the crucible was transferred to a desiccator for cooling to avoid absorption of moisture by the ash. The cold ash along with silica crucible was weighted and the result was calculated and reported on moisture free basis.

Lysine Content

Lysine content was estimated by the method of Concon (1975) [12]**.** 50 mg very fine sample was taken in 250 ml volumetric flask. 50ml buffer solution (0.05 N tetra Sodium pyrophosphate HCl buffer pH 9.4) was added with gently shaking and kept on plate from shaker for two hours at room temperature. Then it was centrifugated at 10,000 rpm for 10 min. The supernatant was collected and absorbance was recorded at 420nm on photo calorimeter. Then 1ml colouring reagent tri-nitrobenzene sulfuric acid 50 mg/ml aqueous solution was added and again the solution was kept for shaking for period. The absorbance was recorded on 420nm. the calculation was done by standard curve.

Tryptophan Content

0.2 g homogenized sample was transferred in 100 ml of conical flask and 10 ml 19 NH2 SO4 was added. The content of conical flask was kept for 12 hours in dark place. After expiry of period 1 ml distilled water l ml p- dimethyl amino benzaldehyde 80 mg dissolved in 100 ml 2 N H2SO4 and 0.1 ml of sodium nitrite solution (0.45% in water) were added. This was kept for 30 minutes for colour development. This intensity of colour was measured in photoelectric colorimeter (Sepectronic-20) at 620 nm. The calculation was done by standard curve[13].

Estimation of Methionine

Methionine content was estimated by the methods of Horn *et al.,* (1946) [14].

Statistical Analysis

All data recorded as mean±S.D. in triplicate (n=3) experiments according to two-way ANOVA at 0.05% level to contribute the data analysis significantly.

RESULTS AND DISCUSSION

The results showed the oil content in the range of (36.47-38.8%). The highest value was found in fawn (38.8 %) followed by brown (37.10 %), similar result were reported [15, 16, 17, 18] **.**The protein content in the range of (31.69-36.21%). The highest protein value was obtained in yellow seeds (25%) followed by fawn (33.73 %) and other genotypes and lowest protein content was obtained in brown (31.69%). Variation was due to the changed genetic characters, these observations are in according to the results[18, 19, 20, 21, 22]**.** The lysine was in range (1.14 - 1.17%). The highest value was achieved in Brown seeds (1.17%) followed by yellow seeds (1.15%) and other species and the lowest lysine contain was obtained in fawn seeds similar result were reported[23, 24, 25] **.**The tryptophan content ranged from (0.43-0.48%). The highest value was achieved in yellow seeds (0.48%). Similarly results were reported [23].The content of methionine was in range of (0.27-0.29 %). The highest value was obtained in fawn seeds (0.29 %) followed by yellow (0.28 %) and other species and the lowest Methionine content was obtained in species brown. The study is agreement with those reported [24, 25, 26, 27]. The ash content was in the range of (5.76-5.94%). The highest value was found in species in brown seeds (5.94%) followed by yellow seeds (5.93%) The values obtained in the present investigations were found in confirmation with the findings [21, 28, 29].

Table 1
Cake content analysis of linseed seeds

Linseed seed	Oil %	Protein%	Lysine%	Tryptophan%	Methionine%	Ash content%
Fawn seeds	38.8 ± 1.62	33.73 ± 4.06	1.14 ± 0.05	0.43 ± 0.10	0.29 ± 0.02	5.76±0.60
Yellow seeds	36.47±1.5	36.21 ± 9.63	1.15 ± 0.06	0.48 ± 0.04	0.28 ± 0.04	5.93±0.49
Brown seeds	37.10 ± 2.2	31.69 ± 9.56	1.17 ± 0.02	0.43 ± 0.03	0.27 ± 0.02	5.94±0.60

All values given in table are expressed as mean±SD of triplicate data (n=3) observed.
*** *Significant at 0.05% level, according to two-way ANOVA statistical analysis.***

CONCLUSION

In current finding, it is concluded that yellow seeds are the good source of protein, amino acid and ash content. The genotypes of fawn seed show the highest oil content followed by yellow and brown colour linseed seed.This variation in the biochemical composition was due to different genetic characters.

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