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Comparative Study of Fatty Acid Composition between Normal and Blighted Seed of Linseed (CV. Chambal)

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Abstract

This study was carried out at Northern Bundelkhand Religion during 2013-2014 and 2014-2015. Data were taking and mean of data were given in Table 1. Anova in reduction of fatty acid composition with normal and blighted seed of linseed (CV. Chambal) were given in Table 2. The fatty acid composition alteration was found statistically significant at 5% level of significance. All parameters of fatty acid composition were reduced in blighted seed except Lionolenic acid. Linolenic acid was increased in blighted seed in comparison of normal seed of linseed.

Key words: *Linseed (CV. Chambal), Blighted seed, Normal seed, Fatty acid Composition*

Introduction

Linseed is considered to be a very important crop on account of the various uses to which it is put. Its seed yields an excellent drying oil, which is primarily used in paints and varnishes. The seeds as well as fibers of the crop are very important for human being because the seeds of the crop which contains a good amount of oil (33 to 47 percent) which is used in paint and varnish industries as fast drying oils. It also has some medicinal properties for curing the arthritis and some bone related disorders in rural areas. The fibers are blend well with cotton, silk, jute and other clothing materials (Sharma,2016). The name linen is mainly associated with the crop as in ancient time bearing of the linen cloths was the symbol of aristocracy .The rough fibers are used for making canvas and gunny bags while its stem is used in preparation of pulp for making currency notes .It is also used in manufactures of linoleum, oilcloth, water proof fabrics, printing ink etc. The oil cake is used as a cattle feed and also as a manure. A good quality fiber is obtained from the straw.

Flaxseed (Linum usitatissimum L.), one of the oldest cultivated crops, continues to be widely grown for oil, fiber, and food (Oomah, 2001). The average worldwide flaxseed production between 2007 and 2011 was 1,862,449 tonnes (FAO, 2011). Flaxseed oil is an excellent source of the omega-3 fatty acid linolenic acid with typical levels of 55% in the oil (Oomah, 2001) making it ideal for paints, varnishes, and inks due to its fast polymerization properties. Increasing demand for edible oil sources with significant percentages of omega-3 fatty acids is resulting in consumption of flaxseed as a functional food. Flaxseed is also added to animal feed to improve animal reproductive performance and health (Heimbach, 2009; Turner *et al*.(2014). Mature flaxseed is oblong and flattened, comprising an embryo with two cotyledons surrounded by a thin endosperm and a smooth, often shiny yellow to dark brown seed coat (hull). Analysis of brown Canadian flaxseed conducted by the Canadian Grain Commission showed the average composition of commercial seed was 41% fat, 20% protein, 28% total dietary fiber, 7.7% moisture, and 3.4% ash (DeClercq, 2012). Minor components included: cyanogenic glycosides, phytic acid, phenolics, trypsin inhibitor, linatine, lignans (phytoestrogens), minerals, vitamins, cadmium, selenium and cyclolinopeptides (CLs). The reported protein content of flaxseed varies widely from 10 to 31% . Approximately 56 to70% of the protein is found in cotyledons and about 30% in the seed coat and endosperm Flaxseed protein contains higher amounts of arginine, aspartic acid, and glutamic acid than other amino acids The essential amino acids found in flaxseed meal are similar in concentration and composition to those in soybean.

Flaxseed contains substantial soluble and insoluble fiber. Cui (2001) reported the content of insoluble and soluble fiber to be 20% and 9%, respectively, whereas reported 30% and 10%, respectively. The differences likely arise from seed and/or extraction protocols used. Soluble fiber, also known as mucilage, occurs in the seed coat and is readily extracted with

hot and less readily with cold water (Paynel et al., 2013). This soluble fiber includes acidic [composed of L-rhamnose (25.3%), L-galactose (11.7%), L-fructose (8.4%), and D-xylose (29.1%)] and neutral polysaccharides [L-arabinose (20%) and D-xylose/D-galactose (76%)]. (Anderson & Lowe, 1947). Insoluble fiber is composed of cellulose (7e11%), lignin (2e7%), and acid detergent fiber (10e14%) (Cui et al., 1994). Flaxseed mucilage arabinogalactans are associated with protein (Ray et al., 2013). Flaxseed oil content of ranges from 38 to 44% due to genotype and environmental parameters. Microscopic membrane bound oil bodies, known as oleosomes, are the main storage form of oil in the endosperm and cotyledons. Oleosomes may be extracted from other seed components and they contain CLs (Gui, Shim, & Reaney, 2012). Fatty acid composition varies among different flaxseed types and cultivars. The majority of the flaxseed oil (75%) is found in cotyledons, with much of the remaining oil (22%) present in the seed coat and endosperm. The oil is primarily in the form of triacylglycerides.

Mukhopadhyay *et al*., (2001) suggested that flax is increasingly used as an ingredient in feeds for improved animal and fish nutrition. The benefits of omega-3 fatty acids to pigs, cattle, horse and other animals may be in preventing young animals from developing infections

Stramkala *et al*., (2003**)** studied that oil flax seed contains about 5.1 – 11.7% carbohydrate (Mucilaginous substances), cotyledons contain on average 25-45 % fat and up to 30 % of protein. A part from these substances, flax seed contains carbohydrates, phosphorous compounds that are similar to fat in their composition, pigments, carotene, glycoside linamarine, enzymes (lipase, protease, etc.) and other substances

Ponter *et al*., (2006) said that flax seed is rich in lanoline acid added to the diet of post partum dairy cows on ovarian follicle growth and milk and plasma fatty acid

Materials and Methods

Samples of whole flaxseed normal as well as blighted were collected from experimental field and sun dried Samples were finely ground with a commercial coffee grinder. Approximately 1 to 2 g of the sample was weighed out into a 50-mL centrifuge tube, and C13 internal standard was added. Lipids were extracted from the flaxseed by using the method of Bligh and Dyer. Approximately 50 to 200 μ L of the lower chloroform phase was added to a test tube along with 2.0 m L of boron tri-chloride in 14% methanol. The tube was then capped and methylated in a boiling water bath for 15 min. Tubes were allowed to cool and then vortexed. Approximately 1 μ L of the upper hexane layer was then withdrawn into gas chromatography vials for injection. The fatty acid methyl esters were analyzed using a Varian 3400 gas chromatograph with a 60-m × 0.32-mm inside diameter, DB-23 capillary column, 0.10-μm film thickness. The quantification of fatty acid methyl esters was based on comparison to a known internal standard. Three replications were taken for each parameter and mean was calculated for further statistically analysation using RBD.

Results

Fatty acid composition of normal and blighted seeds of linseed

The average of all parameters was calculated and differences were calculated in per cent given in Table 1. The differences of fatty acid composition were calculated as fatty acid composition of Blighted seed subtract from fatty acid composition of normal seed. Data of difference of fatty acids were statistically analysed and ANOVA was given in Table 2. The results showed that all the fatty acids were statistically found significantly declined due to infection of linseed blight except Linolenic acid. More reduction was noted in Palmitic acid, Oleic acid, linoleic acid and Iodine value. Palmitoleic acid and stearic acid were less declined while Linolenic acid was increased when compared with normal seeds. High reduction in oil content was also recorded in infected seeds as compared with normal one. The oil colour (Refractive Index) was also changed with dark brown colour with moldy smell when compared with normal. CD was found .023.

Table: 1 Fatty acid composition of normal and blighted seeds of linseed (CV. Chambal)

Sr. No.	Fatty acid	Normal seed	Blighted seed	% Reduction	Reduction
1	Palmitic acid	5.45	3.14	42.39	2.31
2	Palmitoleic acid	0.05	0.01	80.00	0.04
3	Stearic acid	2.94	2.03	30.95	0.91
4	Oleic acid	17.67	14.18	19.75	3.49
5	Linoleic acid	12.95	11.99	7.41	0.96
6	Linolenic acid	58.90	61.10	3.74	-2.18

7	Oil content	41.7 %	29.8%	28.54	11.90
7	Iodine value	147	136	7.48	11.00

Table 2 Fatty acid composition differences of normal and blighted seeds of linseed

ANOVA					
Sources of variance	**DF**	**SS**	**MSS**	**Fc**	**Ft**
replication	2	0.44	0.222	7.05	
Treatments	7	68.69	9.812	311.19	2.14
Error	14	0.44	0.032		
Total	23				

CD =.023

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