Journal of Agricultural Science; Vol. 8, No. 5; 2016
ISSN 1916-9752 E-ISSN 1916-9760
Published by Canadian Center of Science and Education

Screening of Cotton Genotypes for Protein Content, Oil and Fatty Acid Composition

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Received: February 16, 2016 Accepted: March 19, 2016 Online Published: April 15, 2016

doi:10.5539/jas.v8n5p107 URL: http://dx.doi.org/10.5539/jas.v8n5p107

Abstract

The increase in the population at the global level necessitates to explore promising approaches to increase food supply, including protein and oil, to meet the needs of the people. Cotton is one of the most important oil producing crops and cottonseed meal provides important protein nutrients as animal feed. However, information on the genetic basis of cottonseed oil and protein contents is lacking. In this study; protein contents, oil and fatty acid composition of 124 cotton genotypes were observed for developing new cultivars. Accelerated Solvent Extraction method used for determining fat ratio; Gas Chromatography employed for fatty acid analysis while protein contents were analyzed by Kjeldahl method. Average crude oil 31.0%, total fat contents varied from 23.11 to 37.70% while mean protein content 38.0% were observed among genotypes. The dominating fatty acids included linoleic acid, palmitic acid and oleic acid (46.91, 25.73 and 20.21%) respectively, while linolenic acid (0.13%), γ-linolenic (0.33%), palmitoleic acid (0.64%), myristic acid (0.88%), nervonic acid (1%) and stearic acid (2.38%) had variations in fatty acid contents. Frequency distribution of the parameters showed a normal distribution and differences among genotypes for the traits studied were statistically highly significant. Prinicipal component analysis showed a complex opposite relationship with a total protein and oil contents. Genotypes; Fantom for protein, Cirpan 60 for total crude oil, Stoneville 468 and YB195 for higher amount of fatty acids especially oleic acid; can be used for improvement of cottonseed quality in breeding programs.

Keywords: genotype, cottonseed, nutritional value, oil, protein, fatty acids

1. Introduction

Cotton belongs to genus *Gossypium* and *Malvaceae* family that grows naturally as a perennial, but for commercial purposes is grown as an annual crop (Wakelyn & Wan, 2003). Cotton is a major crop in the world (Yu et al., 2012). The five largest cottonseed producing countries (China 26.4%, India 25.8%, USA 10.7%, Pakistan 7.9%, Brazil 6.5%) currently account for 77.3% of global output (ICAC, 2015). Cotton fiber is a source of natural textile, and cottonseed is a source of oil for human consumption, cotton meal and minerals for livestock feed (Yu et al., 2012; He et al., 2013). Therefore, maintaining high quality fiber and cottonseed nutritional value is critical. Cottonseed is the second major product from the cotton plant (after fiber) which serves as raw material for oil extraction or animal feed production (Hamilton et al., 2004; Ashokkumar & Ravikesavan, 2008).

Cottonseed oil is among the most unsaturated oils, others being safflower, corn, soybean, rapeseed and sunflower seed oils. Oil cakes/oil meals are by-products obtained after oil extraction from the seeds. Oil cakes are of two types, edible and non-edible. Edible oil cakes have a high nutritional value; especially have protein contents ranging from 15% to 50% (Ramachandran et al., 2007). Cottonseed oil has a ratio of 2:1 of polyunsaturated to saturated fatty acids and generally consists of 65-70% unsaturated fatty acids including 18-24% monounsaturated (oleic) and 42-52% polyunsaturated (linoleic) and 26-35% saturated (palmitic and stearic) (Agarwal et al., 2003). Cottonseed oil performs better than other oil as it lasts a long time and stores well by withstanding higher temperature for food items due to its high antioxidant content (Sekhar & Rao, 2011).