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# EFFECT OF SULFOSALICYLIC ACID ON FATTY ACID COMPOSITION OF GROUNDNUT SEEDS

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**Abstract**:

A study was carried out to study the effect of Sulfosalicylic acid on the oil content and fatty acid composition of groundnut (*Arachis hypogaea* L.) seeds of Cv. SB-11. The treatments comprised of different concentrations (5, 50, 100 and 200 ppm) of Sulfosalicylic Acid (SSA). Gas liquid chromatographic analysis of fatty acid methyl esters revealed that the SSA treatments increased saturated fatty acids and monounsaturated fatty acids (MUFAs). In contrast to it decreased content of total polyunsaturated fatty acid (PUFA) was detected in seeds of groundnut plants treated with SSA. Among the MUFAs, noteworthy content of oleic acid (18:1) was observed in seeds of higher concentrations (100 and 200 ppm) applied groundnut plants. However effective increase in Gamma linolenic acid (18:3n6) was recorded with the treatment of 50 ppm SSA. The increase in total fat content of groundnut seeds was observed with all the treatments of SSA over control. In particular maximum fat content was observed in seeds of 50 ppm SSA treated peanut plants. Trans fats were not detected in seeds by all the treatments.

**Keywords**: Fatty acid, Sulfosalicylic acid, Groundnut seeds

## Introduction:

The groundnut is an annual oilseed legume crop. Groundnut seeds are rich source of oil and proteins. Groundnut seeds are an excellent source of edible oil, naturally containing from 40-50% [1]. In oilseed crops fatty acid composition of oils plays key role in determining the shelf life, nutritional value, flavor of products as well as functional properties [2]. Due to the higher extent of MUFA in peanut oil, it is superior to low diets for heart health. Monounsaturated and Polyunsaturated fatty acids have attracted a great attention in last decade due to their health benefits [3]. The quality of oil is related with the percentage of oleic acid and linoleic acid. The high oleic acid containing oils are more stable. Health benefits of peanut consumption such as control of weight gain, prevention of Alzheimer disorder, cancer inhibition and prevention of cardiovascular diseases have been reported by several workers [4] [Peanut Institute, 2002].

Now days incase of oilseed crops the main agenda before plant scientists is to develop strategy to improve nutritional quality. Several studies have been recognized influence of climate, irrigation, fertilizers and plant growth regulators on the yield, protein, amino acid and oil content of groundnut [5, 6]. Salicylic acid (SA) is a phenolic compound and is considered as a plant hormone [7]. SA and its derivatives have been reported to be involved in various physiological processes of plants [8, 9]. 5-sulfosalicylic acid (SSA) is a derivative of SA. There are evidences that SSA influences growth, nutrient uptake and antioxidative enzyme activities, involved in multiple stress tolerance and plays role in increasing vase life of cut flowers [10, 11, 12]. In this regard the present investigation was carried out to assess the influence of SSA on nutritionally desirable fatty acid composition of groundnut seed oil.

## Material and Methods

The experiment was laid out in Randomized Complete Block Design (RCB) with three replications. Seeds were sown in 5×3 m field plots. The groundnut plants at the age of 30 days were sprayed with different concentrations (5, 50, 100 and 200 ppm) of SSA as a foliar spray @ 40-50 ml/plant in 3 equal doses at 4 days interval. The plants receiving foliar sprays of distilled water served as control. Fatty acid composition and total oil content of dried seeds were studied after harvesting. The dried seeds of groundnut were powdered and oil was extracted with petroleum ether in a Soxhlet apparatus. Then, the solvent was completely removed under reduced pressure in a rotary to yield the fixed oil. The oil content was estimated by Nuclear Magnetic Resonance (NMR) Spectrophotometer against a standard reference sample. Fatty acid methyl esters (FAMEs) were analyzed by GC-FID (A SHIMADZU GC-17-A gas chromatograph with flame ionization detector).

## Result and Discussion:

Data presented in table 1 show that foliar application of SSA increased saturated fatty acids, MUFAs as well as total fat contents of groundnut seeds over control. The highest fat (oil) content was recorded in seeds of 50 ppm SSA treated groundnut plants. Effect of SSA on composition of saturated fatty acids, MUFAs and PUFAs are represented in Table 2, 3 and 4 respectively. SSA treatments was found to be increased saturated fatty acids such as palmitic acid, stearic acid, arachidic acid, behenic acid and lignosteric acid than the seed oils of untreated plants. In contrast to it application of 200 ppm SSA decreased stearic acid content. The highest content of oleic acid (MUFA) found with application of higher concentrations of SSA. However incase of PUFAs only 100 ppm SSA noticeably increased gamma linolenic acid content (omega-6 fatty acid) of peanut oil. Docosadienoic Acid content was found to be increased significantly by all the applied SSA treatments.

Oleic acid affluent peanut oil consumption can be effective in type II diabetes and non musculin dependent mellitus [13]. Gamma linolenic acid (GLA) reduces the risk of heart attack, strokes and diabetes [14]. Our earlier studies shown salicylic acid (SA) and acetyl salicylic acid (ASA) mediated increased levels of MUFAs and PUFAs and total oil content of peanut oil [15, 16]. In contrast to ASA and SSA, SA lowered saturated fatty acids and increased alpha linoleic acid in great manner. The foliar application of salicylic acid significantly increased content of linoleic acid while decreased linolenic acid content of sunflower [17]. No any evidence found on influence of SSA on fatty acid composition.

**Table 1** Relative Proportion of Saturated, Monounsaturated and Polyunsaturated Fatty Acids of Groundnut Seeds of SSA Treated Plants

| Treatment (ppm) | Saturated Fatty Acids (%) | Monounsaturated Fatty Acids (MUFAs) (%) | Polyunsaturated Fatty Acids (PUFAs) (%) | Oil Content (g/100g) |
|---|---|---|---|---|
| Control | 27 | 43 | 30 | 45.87 |
| 5 | 31 | 47 | 22 | 47.7 |
| 50 | 33 | 46 | 21 | 48.9 |
| 100 | 34 | 48 | 18 | 46.7 |
| 200 | 30 | 49 | 21 | 46.95 |

**Table 2** Effect of SSA on the Composition of Saturated Fatty Acids of Groundnut Seed Oil

| Treatment (ppm) | **Saturated Fatty Acid Composition (%)** | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | Caproic Acid (6:0) | Caprylic Acid (8:0) | Myristic Acid (14:0) | Palmitic Acid (16:0) | Heptadecanoic Acid (17:0) | Stearic Acid (18:0) | Aracidic Acid (20:0) | Heneicosanoic Acid (21:0) | Behenic Acid (22:0) | Tricosanoic Acid (23:0) | Lignoceric Acid (24:0) |
| Control | 0.02 | 0.01 | 0.02 | 12.95 | 0.05 | 5.97 | 1.48 | 0.07 | 4.26 | 0.04 | 1.81 |
| 5 | 0.08 | 0.03 | 0.02 | 14.90 | 0.07 | 6.55 | 1.74 | 0.17 | 4.93 | 0.06 | 2.19 |
| 50 | 0.07 | 0.09 | 0.04 | 16.74 | 0.07 | 7.84 | 1.61 | 0.05 | 4.80 | 0.06 | 2.07 |
| 100 | 0.07 | 0.06 | 0.13 | 16.65 | 0.07 | 7.75 | 1.81 | 0.06 | 5.11 | 0.06 | 2.26 |
| 200 | 0.08 | 0.03 | 0.15 | 15.77 | 0.08 | 5.02 | 2.26 | 0.09 | 4.94 | 0.06 | 1.71 |

**Table 3** Effect of SSA on the Composition of Monounsaturated Fatty Acids (MUFAs) of Groundnut Seed Oil

| Treatment (ppm) | **Monounsaturated Fatty Acid Composition (%)** | | | | | | |
|---|---|---|---|---|---|---|---|
| | Myristoleic Acid (14:1) | Palmitoleic Acid (16:1) | Heptadeca noic Acid (17:1) | Oleic Acid (18:1) | Eicosen oic Acid (20:1) | Erucic Acid (22:1) | Nervoinic Acid (24:1) |
| Control | 0.00 | 0.68 | 0.00 | 41.21 | 0.98 | 0.09 | 0.06 |
| 5 | 0.07 | 0.37 | 0.01 | 44.95 | 1.53 | 0.03 | 0.04 |
| 50 | 0.08 | 0.59 | 0.04 | 43.64 | 1.50 | 0.03 | 0.06 |
| 100 | 0.07 | 0.43 | 0.03 | 45.07 | 1.80 | 0.03 | 0.07 |
| 200 | 0.08 | 0.64 | 0.03 | 45.37 | 2.46 | 0.03 | 0.08 |

**Table 4** Effect of SSA on the Composition of Polyunsaturated Fatty Acids (PUFAs) of Groundnut Seed Oil

| Treatment (ppm) | **Polyunsaturated Fatty Acid Composition (%)** | | | | | | |
|---|---|---|---|---|---|---|---|
| | Linoleic Acid (18:2) | Alpha-Linolenic Acid (18:3n3) | Gamma-Linolenic Acid (18:3n6) | Eicosadienoic Acid (20:2) | Eicosatrienoic Acid (20:3) | Eicosapentaenoic Acid (20:5) | Docosadienoic Acid (22:2) |
| Control | 29.51 | 0.23 | 0.24 | 0.01 | 0.15 | 0.07 | 0.07 |
| 5 | 21.18 | 0.04 | 0.23 | 0.02 | 0.45 | 0.04 | 0.28 |
| 50 | 19.69 | 0.13 | 0.29 | 0.02 | 0.17 | 0.03 | 0.28 |
| 100 | 17.75 | 0.05 | 0.17 | 0.02 | 0.16 | 0.04 | 0.26 |
| 200 | 20.41 | 0.12 | 0.17 | 0.02 | 0.08 | 0.05 | 0.27 |

**Conclusion**

Eventhough, saturated fatty acids of groundnut seeds increased due to treatments of SSA, high contents of oleic acid with SSA treatments may maintain the quality and stability of oil thereby increasing shelf life of oil. Oleic acid (omega 9 fatty acid) and gamma linolenic acid rich peanut oil due to SSA treatments can also be effective in type II diabetes and help reduce the risk of cardiovascular diseases. The increased arachidic and behenic acid may help in emulsification and stabilization of peanut products. Thus it is evident that SSA contributes to improve quantitative as well as qualitative enhancement of peanut oil.

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