VITAMIN E (TOCOPHEROL) CONTENT OF SOYBEAN (*Glycine max* L.Merril) AND IT'S RELATIONSHIP TO ESSENTIAL FATTY ACID CONTENT

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ABSTRACT

Soybean (*Glycine max* L. Merril) has been considered an important world crop because it has a unique chemical composition. On an average dry matter basis, soybean contains about 40 % protein and 20 % fat. Soy fat contains a high proportion of vitamin E (alpha tocopherol) and the essential fatty acids such as linoleic and α-linolenic acids. Tocopherols are natural antioxidants with heart/vascular, and cancer protective properties. Essential fatty acids are the precursors of prostaglandins, prostacyclins and tromboxanes; and they have anti-inflammatory and anti tumor effects. The balance between tocopherol and essential fatty acid content mainly determine the susceptibility to lipid peroxidation and the storage stability. Therefore vitamin E and linoleic and linolenic acid contents of Sri Lankan soybean varieties, under different processing conditions, sprouting time and storage for different periods in different packaging materials were studied.

Soybean cultivars differed significantly ($p<0.05$) in fat content but not in vitamin E content. Among the four soybean cultivar Pb-1 had the highest fat content (21.1 %) and PM-13 had the lowest fat content17.9 %. Vitamin E content of these cultivars ranged from 5.7 – 7.4 μg/g of dried seed. These cultivars also differ significantly ($p<0.05$) in linoleic acid and linolenic acid content. The cultivars Pb-1 and Bossier had the highest linoleic acid (107.6 mg/g of seed) and highest linolenic acid (17.9 mg/g of seed) respectively. While the cultivar PM-13 and Pb-1 had the lowest linoleic acid (91.2 mg/g of seed) and linolenic acid

(14 mg/g of seed) respectively. Soybean cultivars did not show any correlation between vitamin E and essential fatty acids.

Among the 4 different processing conditions the mean fat content of boiled (18.2%) and baked (18.3%) samples was significantly lower ($p<0.05$) than unprocessed (18.9 %) sample (PM 25 variety). However, the fat content of pressure cooked (18.6%) and fried samples (19.1%) did not differ. Vitamin E content of pressure cooked (1.46 µg/g of seed) and boiled (0.3 µg/g of seed) samples was significantly lower compared to unprocessed sample. Vitamin E was completely lost in fried and baked samples. The linoleic and linolenic acid contents of the unprocessed sample were significantly ($P<0.05$) higher than all processed samples. The linoleic acid content of the processed samples ranged from 83.95 – 99.50 mg/g of seed and linolenic acid from 10.92 – 17.6 mg/g of seed. A significant positive correlation between vitamin E and linoleic acid ($r=0.58$) and linolenic acid ($r=0.46$) content was observed due to pressure cooking and boiling of the seeds.

Fat content of cultivar Pb-1 progressively and significantly decreased with the period of germination (24, 48 and 72 hours). However the vitamin E content in germinating seeds increased up to 48 hours and then declined; a 1.8 fold increase was observed at 48 hours. Vitamin E content of the seeds after 48 (12.63 µg/g of seed) and 72 hours of germination (10.18 µg/g of seed) was significantly higher than ungerminated seeds. The linolenic acid content of the germinated soybean seeds increased with germination time and the highest linolenic acid content were observed after 72 hours of germination. The linoleic acid content

of the germinated seeds ranged from 103.65 – 107.57 mg/g of seed and linolenic acid from 13.22 – 18.27 mg/g of seed. A significant positive correlation between vitamin E and linolenic acid (r=0.71) was observed in the germinated seeds.

The fat content of seeds (cultivar PM-13) packed in aluminum foil, polythene and paper and in unpacked state increased significantly during storage, but the vitamin E content significantly decreased. The rate of increase in fat % in seeds stored for 6 months when compared to fresh seeds is low in seeds packed in aluminum foil (5 %)followed by seeds packed in polythene (7 %) and paper (10 %).Unpacked seeds showed the highest level of increase (12 %). Fat content of the aluminum foil, polythene, paper packed and unpacked soybean seeds stored for 6 months are 18.8, 19.2, 19.6 and 20.0% respectively. The rate of decrease of vitamin E when compared to fresh seeds is low in seeds packed in aluminum foil (42 % after 3 months) followed by seeds packed in polythene (57 % after 3 months) and paper (71 % after 3 months) and unpacked seeds showed the highest level of decrease (80 % after 3 months) Vitamin E content of the aluminum foil, polythene, paper packed and unpacked soybean seeds stored for 6 months is 1.2,1.4,0.9 and 0.4 µg/g of seed respectively. Linoleic acid content of the samples stored for 3 and 6 months was significantly lower from fresh seeds. But linolenic acid content of the 3 months stored sample was not significantly different from fresh seeds. Linoleic acid in seeds packed under 4 different conditions and stored for different periods ranged from 82.5 – 94.8 mg/g of seed while the linolenic acid in seeds packed under 4 different conditions and stored for different periods ranged from 9.9 – 16.5 mg/g of seed. Soy bean seeds packed in aluminum foil, polythene and paper and stored

for 3 and 6 months period showed a significant negative correlation between vitamin E and linoleic acid and linolenic acid contents indicating that both vitamin E and essential fatty acid content decreased with increasing storage time. This correlation is high in seeds packed in paper compared to other packing materials.