

Effect of Seed Coat Color and Seed Weight on Protein, Oil and Fatty Acid Contents in Seeds of Soybean (*Glycine max* (L.) Merr.) Germplasms

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Seed coat color and seed weight are among the key agronomical traits that determine the nutritional quality of soybean seeds. This study aimed to evaluate the contents of total protein, total oil and five prominent fatty acids in seeds of 49 soybean varieties recently cultivated in Korea, and assess the influences of seed coat color and seed weight on each. Total protein and total oil contents were in the ranges of 36.28-44.19% and 13.45-19.20%, respectively. Likewise, individual fatty acid contents were in the ranges of 9.90-12.55, 2.45-4.00, 14.97-38.74, 43.22-60.26, and 5.37-12.33% for palmitic, stearic, oleic, linoleic, and linolenic acids, respectively. Our results found significant variations of protein, oil and fatty acid contents between the soybean varieties. Moreover, both seed coat color and seed weight significantly affected total oil and fatty acid contents. Total protein content, however, was not significantly affected by any factor. Among colored soybeans, pale-yellow soybeans were characterized by a high level of oleic acid (30.70%) and low levels of stearic (2.72%), linoleic (49.30%) and linolenic (6.44%) acids, each being significantly different from the rest of colored soybeans ($p < 0.05$). On the other hand, small soybeans were characterized by high levels of all individual fatty acids except oleic acid. The level of oleic acid was significantly high in large seeds. Cluster analysis grouped the soybeans into two classes with notable content differences. Principal component analysis also revealed fatty acids as the prime factors for the variability observed among the soybean varieties. As expected, total oil and total protein contents showed a negative association with each other ($r = -0.714$, $p < 0.0001$). Besides, oleic acid and linoleic acid showed a tradeoff relationship ($r = -0.936$, $p < 0.0001$) which was reflected with respect to both seed coat color and seed weight. In general, the results of this study shade light on the significance of seed coat color and seed weight to distinguish soybeans in terms of protein, oil and fatty acid contents. Moreover, the soybean varieties with distinct characteristics and nutritional contents identified in this study could be important genetic resources for consumption and cultivar development.

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