Assessment Level of Some Anti-Nutritional and Nutritional Factors In Some Egyptian Cultivated Soybean and Barley

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Abstract :

As a main source of protein, soybeans (Glycine max (L) Merril) and barley (Hordeum vulgare) provide the human and animal nutrition essential amino acids that are required for healthy individuals. However, these crops contain secondary plant metabolites, considered as anti-nutritional factors, which display negative effects on nutritional qualities produced. Three genotypes of soybean Giza35 (G35), Giza21 (G21), and Giza83 (G83) and three genotypes of barley Giza134 (G134), Giza2006 (G2006), and Giza123 (G123) which together represent the crops harvested in Egypt, were analyzed for their nutritional value and the levels of antinutritional factors i.e. phytic acid, tannins, and total phenol. The ranges of antinutritional factors in soybean seeds were total phenols 18.9–35mg/g, tannins 16.23–18.33mg/g, and phytic acid 1.6–3.08%. On the other hand, the ranges of anti-nutritional factors in barley seeds were total phenols 21– 27.86mg/g, tannins 14.23–18mg/g, and phytic acid 1.2–1.41%. The significant differences among the two crops genotypes were in the total phenol content; it being the highest in both but significantly higher in soybean reaching 45 mg/g but with a larger deviation of values. Barley genotypes reached a highest content of 27.86 mg/g and a low of 21 mg/g.

Introduction

Soy is an alternative source of protein for vegetarians, or for people who cannot afford meat. On the other hand, barely is one of the first cereals to becultivated by man, as it is grown throughout the world.It is used commercially in animal nutrition. Among thesecondary plant metabolites, phytic acid, tannin and vicine have attracted the attention of plant preeders,mainly because their negative effect on the nutritional quality produced .These products are important as antinutritional factors of seeds and basically determined by genetic factors. In general, the anti-nutritional factors of seeds vary widely among species and even among varieties believed that phytic acid, the major storage of pin seeds, had a negative impact on nutritional quality. Since breeding for low phytic acid has been proposed for several cereal and legumes, it is important to predict the effects of selection against phytic acid on other major grain components. Phytic acid (myo-inositol 1, 2, 3, 4, 5, 6, -hexa phosphate) is widespread in plant seed grains and is regarded as the primary storage form of both phosphate and inositol[5]. Additionally, phytic acid is a strong chelating agent that can bind metal ions, reducing availability of Fe, Zn, and Mg.

Materials and Methods

Source of Genotypes: Seeds of six common Egyptian genotypes were obtained from the Institute of
Agricultural Resources Center in Giza, Egypt. The genotypes used in this study were soybean (G35, G21,
G83) and barley (G134, G2006, G123). A random sample of seeds of each genotype was subjected to the
following chemical analysis, as described by Ivarson and Sowden.

Determination of Tannins, Total Phenols, Phytic Acid, Amino acid, and

Detection of SDS-PAGE One dimensional sodium dodecylsulfat polyacrylamide gel electrophoresis was carried out according to Laemmli,[10]. Protein markers or molecular weight standard of MW-SDS (Sigma) were used with bromophenol blue as the tracking dye with a range from 18.0 to 208 KDa. Electrophoresis was run at constant current 40mA or 35mA per 2 gels.Staining was done in 0.125 % coomassie brilliant blue R-250, 50% methanol, and 10% acetic acid for 4 hrs.De-staining was done in 50% methanol 10% acetic acid solution for 2 hrs, then continued de-staining in 5% methanol 7% acetic acid solution for 6 hrs. All assays were done at room temperature. Gels were stored in 7% glacial acetic acid solution until photograph was taken.Statistical Analysis: The data were statisticallyanalyzed according to Snedecor and Cochran]. L.S.D values were used for comparison between means of the aforementioned parameters.

Results

Phytic Acid, Tannin and Total Phenol Analysis: The results indicated that the phytic acid, tannin, and totalphenol were varied among barley and soybean. In barley genotypes (G134, G2006, G123), phytic acidwas recorded 1.41 %, 1.2%, and 1.3% respectively (Figure 1); while in soybean (G35, G21, G83)genotypes recorded 1.6%, 3.08%, and 2.79%respectively (Figure 2). The amount of phytic acid inG21, G83) was more than doubled to those reported byMiranda *et al*,] which was ranged from 0.56% to1.20% (phytic acid) in soybean cultivars, however, G35 was found to have similar phytic acid content. Highconcentrations of phytic acid usually found in legumes to be used as alert, considering that phytic acid can act as a chelating agent on some important nutritional ionsi.e. zinc, calcium, magnesium, and iron]. On the other hand, tannin levels in soybean and barley showed almost the same values (Figure 2). Tannins might varywithin a plant species but the origin of this variationseems to be not well studied as reported byHattenschwiler and Vitousek. In Table 1, the total phenol of various among the barley genotypes, results were showed barley seeds genotype G2006 was

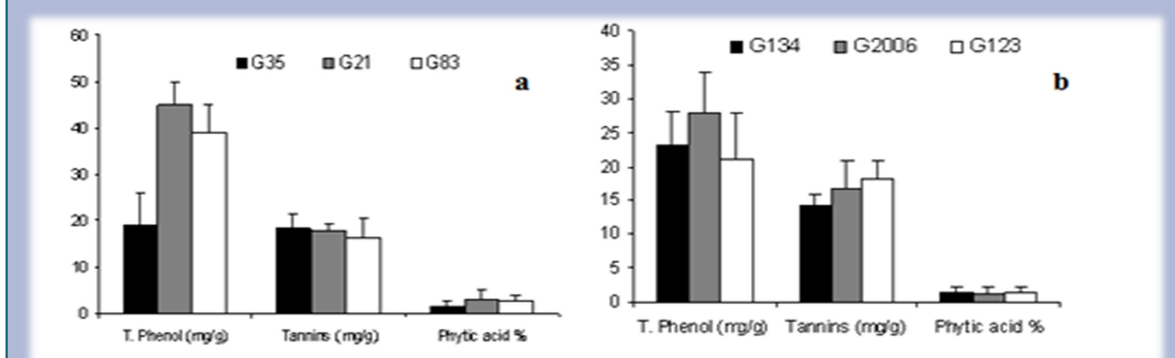
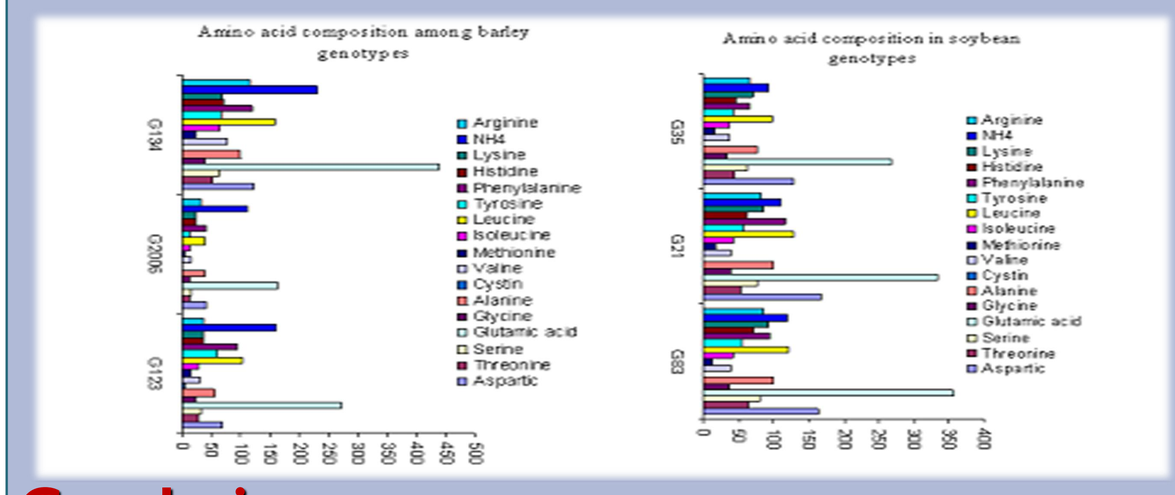


Fig. 1: Phenol, tannin, and phytic acid content in a) soybean (G35, G21, and G83) and b) barley (G134, G2006, and G123) genotypes.



Conclusions

Some anti-nutritional factors were estimated from soybean and barley germplasms where the tannin, total phenols, and phytic acid were tested for each cultivar. These compounds have a positive effect in being antioxidants and negative effect as an anti-nutritional factors. In addition, Results obtained using amino acid analyzer were displayed a large difference in the amount and type of amino acid among different germplasms and also between the two species examined. It was found the highest percentage of amino acids was present in G134 for barley and also results showed the presence of anti-nutritional factors varies for germplasms of soybean and barley. Moreover, we can use these differences among the cultivated genotypes of barley and soybean in consideration during breeding programs in the future

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