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Composition of Amino Acids in Seeds of Different Wheat (*Triticum aestivum* L.) Varieties

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Abstract: *Seed quality of wheat is a vital issue for nutritional purpose. Deficiency of amino acids and proteins, etc. may lead to malnutrition in human. The results suggest that superiority of bread wheat seeds obtained from most common local varieties of Sindh, which are commonly consumed for flour/chapatti, cake and biscuits making. The seeds of three wheat (Triticum aestivum L.) varieties T.J-83, Anmol-91 and SKD-1 were checked for amino acids, pH, EC and moisture content, amino-acids were determined by thin layer chromatography. Almost all the varieties showed optimum pH values but the little variation has been observed in Anmol-91 (6.78). Higher conductivity readings were also noted in T.J-83 as compared to other varieties. Arginine, glycine, hydroxyproline, histidine, β-phenylalanine and were noted in, Anmol-91 and SKD-1 varieties, respectively. However, maximum quantity of known amino acids as well as un-known amino acids was recorded from both T.J-83 and SKD-1 varieties, respectively. Seeds obtained from all varieties had higher moisture content than T.J-83.*

Keywords: *amino acids, chromatography, Triticum aestivum L., wheat seeds.*

I. Introduction

Wheat belongs to grass family Poeceae, tribe hordeae, genus Triticum and specie aestivum. Wheat is the widely grown crop in the world. Wheat crop is widely adapted to a variety of environments and is cultivated in tropical, subtropical and temperate areas (FAO, 2002). Wheat ranks first in the world crop production and is the national food staple of 43 countries. Wheat grain is composed of endosperm and embryo enclosed by bran layers. The endosperm is principally starch and is therefore used as energy food (Bonjean and Augus, 2001). Mostly, whole grain wheat kernels are composed of 80% endosperm, 15% bran and 5% germ (Anderson, 2004). Milling wheat to flour lowered (in decreasing order) concentrations of lysine, arginine, aspartic acid, glycine, alanine, tyrosine, histidine, threonine, and valine. Hard red spring wheats contained less lysine, arginine, and methionine, and more cystine, than hard red winter wheats (Shoup at al., 1966). Higher moisture content, high protein, total sugars and toal lipids among different wheat (*Triticum aestivum* L.) varieties like Mehran-89, Abadgar-93, SKD-1, Imdad-2005, T.J-83 and Anmol-91. Moisture content is positively correlated with pH, total protein and total lipids (Umrani and Pahoja, 2013). Wheat bran is the rough outer covering and has very little nutritional value with plenty of fiber. Wheat germ essentially the embryo of the berry is a concentrated source of vitamins, minerals and proteins (Bonjean and Augus, 2001). The endosperm is made up of hemicelluloses, cellulose and free sugars (Becker and Hanners, 1991). The wheat grain has a wide utility and variety of products, which are prepared and consumed as chapatti, bread, cake, biscuits and pastries. Wheat as a staple diet for human beings, contains 70% carbohydrates, 12% water, 12% proteins, 2.20% crude fiber, 2% fat and about 1.80 % minerals (FAO, 2002). Wheat products contribute world's food supply by providing energy, proteins, amino acids, fats, minerals and vitamins. Because these facts are known and the problem of malnutrition is observed in many parts of the world (Matz, 1996). Proteins are synthesized from twenty essential and non-essential amino acids. Essential amino acids are ones that cannot be synthesized by the body. Non-essential amino acids are those which can be synthesized by the body (Srilakshmi, 2003). The amino acids molecules required for building new tissues (Butt *et al*., 2000). The grains of bread wheat varieties of Sindh are consumed on large scale; hence their nutritional value must be documented. This study was planned to determined and document the status of amino acids in wheat seeds.

II. Materials and Methods

The experiment was conducted at the Department of Crop Physiology, Faculty of Crop Production, Sindh Agriculture University Tandojam. The grains of different varieties viz; T.J-83 Anmol-91 and SKD-1 were obtained from Agriculture Research Institute (ARI), Tandojam. The grain moisture content was determined by

drying the wet seeds of each variety to a constant weight in an oven at100^0C. The pH and conductivity readings were taken by pH and conductivity meters (Jenway 3010 and Jenway 4070). Two dimensional thin layer chromatography was performed for the identification of amino acids in water extract of different wheat seeds using butanol-acetic acid-water (4:1:1v/v/v) and phenol water (4:1 w/v). After drying, the chromatogram was sprayed with ninhydrin and dried in oven for 5 minutes at 80^0C.

III. Results and Discussion

The results given in Table 1 summarized the proximate analysis of wheat seeds different varieties (TJ-83, Anmol-91 and SKD-1). The results showed that each variety contains suitable amount of nutrients. The data indicate the value of moisture content (%). High moisture content (10.86 and 10.66 %) was recorded in Anmol-91, SKD-1. While the low moisture content (8.9 %) was noted in T.J-83. Non-significant difference for moisture content (%) was observed among all the varieties except T.J-83. Moisture content less than 14% is considered safe for the storage of cereals (Manay and Shadaksharaswamy, 1987). Quality seeds should also have an acceptable moisture content to enable storage for longer period. Low moisture content makes grain liable and may cause germination problems such as inducing secondary dormancy (Bishaw and Gastle, 1996). From the above statements it is concluded that the grains of all tested wheat varieties contain moisture enough for germination and storage for longer period.

TABLE 1 Moisture content (%) in seeds of different wheat varieties

Varieties	Moisture content (%)
T.J-83	8.9 b
Anmol-91	10.86 a
SKD-1	10.66 a
CV	6.56
SE ±	1.21

Means followed by common letters are not significantly different at 5% probability level.

The Table 2 shows the values of pH and EC. Variety Anmol-91 showed slightly higher pH value 6.78 than T.J-83 and SKD-1 which showed 6.73, 6.71 respectively.

The EC (µS) recorded for T.J-83, Anmol-91, Abadgar-93 and SKD-1was 40.47, 25.62, and 24.16 µS, respectively. These results indicated that the T.J-83 is suitable for late sowing, while Anmol-91 and SKD-1 are not suitable for early sowing especially under adverse conditions. Anmol-91 is short duration variety and is recommended for late sowing conditions by its parent department. But there is some risk of poor performance under adverse conditions. SKD-1 24.16 µS the lowest conductivity readings suggested that this variety is unsuitable for early sowing or for sowing under adverse conditions.

TABLE 2 Analysis of pH and EC (µS) in seeds of different wheat varieties

Varieties	pH	EC (µS)
T.J-83	6.73 ab	40.47 a
Anmol-91	6.78 a	25.62 d
SKD-1	6.71 b	24.16 d
CV	10.12	5.86
SE ±	0.18	2.23

Means followed by common letters are not significantly different at 5% probability level.

The free amino acids were quantitatively isolated from seeds of different wheat varieties and results are presented in (Table 3). The data reveal that variety T.J-83 contain amino acids like glycine, hydroxyproline, β-phenylalanine. Whereas, arginine, hydroxyproline, β-phenylalanine were present in Anmol-91 and glycine, histidine and β-phenylalanine were calculated in SKD-1. The data revaels that the amino acid composition of each variety is different because, all three varieties contain arginine, glycine, hydroxyproline and β-phenylalanine. Similarly arginine, glycine, histidine, hydroxyproline, β-phenylalanine and some unknown amino acids were also noted in T.J-83, Anmol-91 and SKD-1 varieties, respectively. Moreover, the results suggested that varieties T.J-83 and SKD-1 contained maximum amount of amino acids as compared to Anmol-91 variety.

TABLE 3 Identification of amino acids in seeds of different wheat varieties

Varieties	Amino acids										
	Arginine	**Cysteine hydro-chloride**	**Glutamic acid**	**Glycine**	**Histidine**	**Hydroxy proline**	**Valine**	**β-phenyl alanine**	**L-ornithine monohydro-chloride**	**3-4 dihydroxy phenylalanine**	**Un-known**
Retardation factor (Rf) values of standards	**0.396**	**0.624**	**0.564**	**0.467**	**0.352**	**0.474**	**0.678**	**0.631**	**0.237**	**0.847**	-
T.J -83	-	-	-	0.434	-	0.489	-	0.641	-	-	0.284
Anmol-91	0.387	-	-	-	-	0.471	-	0.640	-	-	-
SKD-1	-	-	-	0.466	0.345	-	-	0.636	-	-	0.285
Mean	0.377	0.613	0.568	0.450	0.351	0.480	0.688	0.637	0.234	0.856	0.252
S.E ±	0.003	0.004	0.015	0.016	0.006	0.009	0.000	0.002	0.003	0.000	0.034
S.D	0.005	0.008	0.210	0.230	0.008	0.013	0.000	0.005	0.004	0.000	0.067

IV. Conclusion

The presence of different types of amino acids in each variety are depend upon the genetic makeup of that particular variety, as for as nutritional purpose is concern varieties T.J-83 and SKD-1 possessed higher quantity of amino acids including unknown amino acids than Anmol-91 variety. Furthermore, overall performance of all the varieties assumed to be optimum concentration of amino acids. Though, variation has been noted in relation to pH, EC in T.J-83 and Anmol-91 as compared to SKD-1and the maximum moisture content was recorded among all the varieties except T.J-83.

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