



Biochemical constituents of the developing grains of wheat cultivars

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Abstract

Present study on three wheat cultivars viz., “C-306”, “IWP-72” and “Pratap” revealed a progressive decrease of Total Soluble Solids .In “IWP-72” variety, the T.S.S declined from 4.95 per cent at 15 days to 2.90 per cent at maturity. Similarly, in “C-306” the T.S.S content decreased from 5.12 to 2.80 percent. In “Pratap” T.S.S decreased from 6.45 to 1.90 percent. Reducing sugar content in test varieties declined at 45 days, to 0.68, 0.70 and 0.60 per cent respectively. Non-reducing sugars also follow the same pattern. At mature stage, starch content goes up to 75.50 per cent of dry weight of wheat grains in the “Pratap”, 72.50 per cent in “IWP-72” and 70 per cent in “C-306” variety. In varieties “C-306 and “IWP-72” the greatest increment in the protein content of about 4.09 and 3.90 per cent respectively was noted between 15 and 45 days. While in “Pratap” increase in protein content was 3.0 per cent.

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Introduction

Wheat is the world's most widely cultivated food crop. In 2007 world production of wheat was 607 million tons, making it the third most-produced cereal after maize (784 million tons) and rice (651 million tons). Maximum area under wheat is in China followed by USA and India. In production USA ranks first. In regard to average yield per hectare, Switzerland ranks first followed by France and Germany. In India, it is the second important staple food crop, rice being the first. Besides staple food, wheat straw is a good source of feed for a large population of cattle in the world (Pal, 1966). Wheat compares well with other important cereals in its nutritive value. It contains more protein than other cereals (Mesfin *et al.*, 2000). Wheat has a relatively high content of Niacin and Thiamine.

Soil with a clay loam or loam texture, good structure and moderate water holding capacity is ideal for wheat cultivation. The best wheat's are produced in the areas favoured with cool, moist weather during the major portion of the growing period followed by dry, warm weather to enable the grain to ripen properly.

(Abou-Guendia and Appolonia, 1973) found a reverse relationship between starch content, reducing and non-reducing sugars in the developing wheat grains. In addition to carbohydrates, the grain proteins are one of the major determinants of wheat quality. The major storage protein of wheat grains, the gluten protein is composed of gliadins and glutenin. They are important, because of their ability to determine the baking characteristic of dough (Brites and Carrillo, 2001).

Our aim of the study was to find out the Carbohydrate and protein content in three wheat varieties at different stages of grain development.

Materials and methods

Present investigation was carried out with three cultivars of wheat (*Triticum aestivum*) viz; "C-306",

"IWP-72" and "Pratap". The crop was raised in the field of Biochemistry Department. Grain samples were collected at 15-day intervals up to 45 days after flowering. The samples were stored at 70 °C until use.

Biochemical estimations

Starch, T.S.S, reducing and non-reducing sugars were estimated by standard methods (Sadasivam and Manickam, 1998). Protein content was estimated by the method of (Lowry *et al.*, 1951).

Results and discussion

The change in starch, T.S.S, reducing sugars, non-reducing sugars and protein content at different stages of grain development are shown in Table-1. In all the varieties the amount of T.S.S in the grain decreased with advancement in the development stage. In "IWP-72" variety, the T.S.S declined from 4.95 per cent at 15 days to 2.90 per cent at maturity. Similarly, in "C-306" the T.S.S content decreased from 5.12 to 2.80 percent. In "Pratap" T.S.S decreased from 6.45 to 1.90 percent. Reducing sugar content also decreased during development of grains in all the varieties. Maximum sugar content in test varieties was at 15 days. It declined at 45 days, to 0.68, 0.70 and 0.60 per cent respectively. Non-reducing sugars also follow the same pattern. These findings fairly correlate with the result of (Abou-Guendia and Appolonia, 1973). Consistent enhancement in starch content in the grain throughout development was observed. At mature stage, starch content contributed upto 75.50 per cent of dry weight of wheat grains in the "Pratap", 72.50 per cent in "IWP-72" and 70 per cent in "C-306" variety. (Cerning and Guilbot, 1973) reported that starch comprises 70 to 85 per cent of the final dry weight of wheat grains.

The highest amount of starch at later stages was due to conversion of sugars into starch (Jenner, 1970). It was observed that protein content in these varieties increased during the development of grains. In varieties "C-306 and "IWP-72" the greatest increment in the protein content of about 4.09 and 3.90 per cent respectively was noted between 15 and 45 days. While

in "Pratap" increase in protein content as 3.0 per cent. Differences in protein content may be related to regulation of protein synthesis, kernel hardness and to

overall quality. These findings are in agreement with (Donovan *et al.*, 1977).

Table 1: Carbohydrate and protein content in three wheat varieties at different stages of grain development (on dry weight basis %).

Variety	Days after flowering	Starch	TSS	Reducing sugars	Non-reducing sugars	Protein
C-306	15	16.16 ± 0.12	5.12 ± 0.22	1.29 ± 0.06	3.85 ± 0.16	6.26 ± 0.95
	30	52.26 ± 0.90	3.90 ± 0.22	0.90 ± 0.01	2.90 ± 0.08	8.90 ± 1.50
	45	70 ± 1.70	2.80 ± 0.9	0.68 ± 0.01	2.20 ± 0.02	10.35 ± 1.30
IWP-72	15	22.0 ± 0.95	4.95 ± 0.27	1.20 ± 0.05	3.72 ± 0.20	5.90 ± 0.83
	30	65.15 ± 0.30	3.85 ± 0.19	0.85 ± 0.04	2.80 ± 0.13	9.35 ± 1.80
	45	72.50 ± 0.50	2.90 ± 0.18	0.70 ± 0.01	2.7 ± 0.04	9.80 ± 0.90
Pratap	15	16.0 ± 0.33	6.45 ± 0.20	1.60 ± 0.07	4.70 ± 0.25	9.0 ± 1.66
	30	70.71 ± 0.17	4.0 ± 0.09	0.90 ± 0.03	3.0 ± 0.15	10.33 ± 1.22
	45	75.50 ± 0.65	1.90 ± 0.01	0.60 ± 0.03	2.0 ± 0.01	12.0 ± 1.10

Mean of three replication ± S.D.

Hence, it may be concluded from the above study that at maturity starch and protein content is remaining at peak.

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