Sindh Univ. Res. Jour. (Sci. Ser.) Vol. 47 (4) 839-842 (2015)

SINDH UNIVERSITY RESEARCH JOURNAL (SCIENCE SERIES)

Physicochemical characteristics of wheat grain and their relation with proteins in different Varieties Cultivated in Sindh.

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Received 21st May 2015 and Revised 29rd September 2015

Abstract: The grain size considered to be one of the most important criteria of yield components by the wheat breeders. The variability in this parameter provides footsteps for breeders to plane future wheat breeding programmed for the derived combination in their hybridization programme for improvement of grain size in the new wheat cultivars. The correlation of physicochemical parameters and grain protein show the significant role to determine the grain quality and this information is essential for breeding purpose to enhance the nutritional status of variety. Correlation analysis of thousand kernel weight and grain protein showed moderate positive correlation (r=0.6001*) with p-value 0.023. Grain length correlation with thousand kernel weight showed the strong positive correlation (r = 0.882**) while correlation with width showed the weaker relation (r=0.206).although correlation of length and width with grain protein demonstrate (r = 0.731** and r = 0.113 respectively) length of the grain strongly correlated with protein while width show the negative or weak correlation with protein, in chemical parameters moisture and ash show the relation with protein (r= 0.506* and r= -0.137 respectively) in which moisture showed the moderate positive correlation while ash indicated the negative correlation.

Keywords; Physicochemical, Correlation, Grain protein, TKW

1- INTRODUCTION

Cereals and their products play an important role for food and source of energy (protein) worldwide (khan *et al*., 2011).Cereals is the staple food worldwide and more than half daily energy consumption (Bietz, 1982). Among all the cereals, wheat (*Triticum aestivum L*) 'King of cereals' occupies first position based on its consumption by a large number of people as a foodstuff of life and energy source. Wheat is consumed all around the world since the ancient time (Anjum *et al*., 1998). The cultivation of wheat is simple and adaptable to varied soil and climatic conditions. The bread a product from wheat is more palatable and of high quality than any other cereal. Being the primary source of food for rich and poor population in the world, it covers 20% of the caloric need for a person in the world (Arif *et al*., 2006).

Kernel weight shows the density and size of wheat grain. Wheat varieties which are grown in inorganically had higher thousand grain (1000 kernel) weight and are more grain stiffness as contrast with organically developed wheat varieties, flour yield was negatively correlated with thousand grain weight and size of grain, length and width while positively correlated with grain protein, which directly associated with baking quality of wheat flour (Nitika *et al*., 2008).

Moisture content plays a vital role to determine the wheat grain quality and significant method to determine the property of flour, moisture content affects the water absorption and store the flour quality. Ash content plays an important role to determine the level of bran in the flour and the ratio of bran to endosperm is higher normally in small kernels (Posner, 2000).

2- MATERIALS AND METHODS

Collection of wheat varieties:

Fourteen wheat (grain) varieties were obtained from official organization, Nuclear Institute of Agriculture (NIA) Tandojam,

Size of Wheat grain:

The size of a grain measured through Vernier caliper by taking the grains randomly of each wheat variety was subjected to the measurement of length and width.

Thousand kernel weights:

Thousand kernel weights of all wheat samples were recorded grams/thousand kernels, the weight randomly of each sample is about 50g and thousand kernel weight recorded by counting and weighting the unbroken kernel in physical balance.

Whole Wheat Flour (milling):

The whole wheat flour was prepared by grinding and sieving each wheat variety and stored in an air tight bottle for analysis.

Moisture content: The moisture content obtained by using procedure AACC (2000) method number 44-15A.

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$$\text{Moisture Content} = \frac{\text{Wt. of original sample (g)} - \text{Wt. of dried sample (g)}}{\text{Wt. of original sample (g)}} \times 100$$

Ash content: The ash content of wheat samples were estimated by using the following procedure AACC (2000) method number 08-01.

$$\text{Ash (\%)} = \frac{\text{Weight of ash in sample (g)} \times 100}{\text{Weight of sample (g)}}$$

3- RESULTS ANS DISCUSSION

Size of seed is positively related with seed strength larger seeds have an affinity to produce further vigorous seedlings. Reza *et al*., (2013) reported that grain protein was significantly correlated with thousand kernel weight, grain length and grain width there is a positive correlation in these parameters.

The length and width combined called the L/W ratio, and the ratio indicates the size of the grain and it is taken as a factor, larger ratio is a sign of a long grain while a small ratio indicate a short grain. Butt *et al*., (1997) reported the kernel size of Pakistani wheat with grain length ranging from 5.06-7.01 and 5.79-7.12mm width.

The result regarding to grain length of different varieties of Wheat cultivated in Sindh depicted in Table 1, result shows the grain length ranged from 5.0 mm to 7.0 mm among the different varieties of Sindh with coefficient variance (0.08) and the grain width ranged from 2.9 mm to 3.0 mm with CV (0.07), Variations may be due to the environmental factors or genetic makeup of different wheat varieties. The ratio between the length and width ranged 1.77 to 2.4 with coefficient variance (0.08). The L/W ratio was significantly higher in grain Anmol-91(2.4) and lower weight found in Soghat variety (1.70). Ijaz (2001) reported that size of Pakistani wheat with grain length varying from 5.77mm to 6.88mm. The result of present study closely similar for Ijaz (2001) and Butt (1997) findings, who reported that the grain length about 5.77mm- 6.88mm.

The result about thousand kernel weights among different wheat varieties of Sindh cultivars have been presented in (**Table 1**), which showed that 1000- kernel weights ranged varied from 35.01g - 49.95g. Thousand kernel weight (TKW) was significantly higher in grain Anmol variety (49.95) and lower weight found in Local variety (35.01) which was purchased locally. The wheat variety Anmol and Kiran show the non significant difference while all variety show the significant difference ($p<0.05$) with CV value of all wheat variety is 0.04. Pakistani wheat variety grown in different area reported by many researchers Pasha (2006) investigated the 1000 kernel weight of different wheat variety range selected varieties of Sindh depicted in (**Table 1**), ranged 1.52-2.01% with mean and STD 1.79 ± 0.15 and 26.02-49.03g while Anjum (1998) reported the 1000 kernel weight range 31.43-37.28g, similarly Zenettic *et al*., (2001) reported the thousand kernel weight ranged 42.4-48.7g. The results with respect to 1000 kernel weight observed in the present study fall within the limits reported by Pasha (2006), Zenettic (2001) and Mueenuddin (2007) which reported the range 39.22-43.16g. Halverson and Zeleney (1988) reported that the variation in thousand kernel weights due to genetic control and Environment.

Moisture play an important role for the protection of grain and their products on storage as regards microorganisms, Insects are survives on stored grains and products of grain depend upon the availability of moisture (Hoseney, 1994).

Result of present study regarding moisture content show significance difference among all the varieties, the moisture contents of different wheat variety presented in (**Table 1**), which ranged 8.32 - 11.63% with CV 0.08. The wheat variety possessed significantly high moisture content in variety Soghat -90 (11.63%), however the lowest moisture content found in variety Khirman (8.32%), and Sindh-90 (9.33%). Different scientist found the moisture content in different wheat varieties. Ijaz Ahmed *et al*., (1994) found the moisture content among the wheat varieties ranged 9.01-10.12%, while Muhammad Amjad *et al*., (2010) found the moisture content in Punjab wheat varieties ranged 12.92-13.32%.The results of moisture content of wheat grain in present study are in accordance with the findings of Ijaz *et al*., (2001), Azizi *et al*., (2006) and pasha *et al*., (2006). Azizi *et al*., (2006) analyzed the moisture content range varied from 9.88 - 12. 3%. Ijaz *et al*., (2001) presented the moisture content ranged 9.36 to 10.67% while Pasha *et al*., (2009) studied the range of moisture content which varied from 9.88 - 12.30%.

Ash content is an important parameter indicating the flour extraction rate; the increased extraction rate may be due to the high proportion of aleuronic layer and pericap (Ramirez-Wong *et al*., 2007). There are many factors which are effect the chemical composition of wheat these factors may be genetics and environmental. The result of the concentration of Ash content coefficient variance 0.08. The Ash content shows the high significant difference among each variety except

variety khirman and GP-205 which show the non significance. Ash content was found significantly highest in variety Jauhar (2.01%), however the lowest moisture content found in variety Marvi (1.52%), and TJ 83(1.61%). Similarly finding of different scientist and researchers has also been reported the ash content, Mahmood (1985) reported the ash content ranged 1.46-1.82%, Akhter *et al*., (2005) found the range of ash content varied from 0.31 to 0.50% .The results of ash content of wheat grains are in accordance with the findings of Ahmed *et al*., (1994) which showed the ash content ranged 1.43 to 1.94%.

Protein content comprises in between 8- 15% , The highest amount of total protein content was seen in the variety Anmol (15.42±0.03), while lowest protein content seen in Local (unknown) wheat variety which was purchased from local market (8.28±0.06) and Khirman (10.40±0.01) (Shaista khan *et al*., 2013).

The result of correlation study depicted in (T**able 2)**. Correlation analysis of thousand kernel weight and grain protein showed moderate positive correlation (r=0.6001*) with p-value 0.023. Grain length correlation with thousand kernel weight showed the strong positive correlation (r=0.882**) while correlation with width showed the weaker relation (r=0.206). even though relation of length and width with grain protein demonstrate (r= 0.731** and r=0.113 respectively) length of the grain strong correlation with protein while width show the negative or weak correlation with protein, in chemical parameters moisture and ash show the relation with protein (r= 0.506* and r= -0.137 respectively) in which moisture showed the moderate positive correlation while ash indicated the negative correlation. Reza Drikvand *et al (2013)* found a positive correlation between physicochemical character and grain protein and the present results related to the findings with the study of Reza Drikvand.

Table 1: Physicochemical study: Grain size (mm), width (mm) and L/W ratio, Thousand kernel weight, moisture and ash content) of different varieties of wheat cultivated in Sindh .

Wheat varieties	Grain length(in mm)	Grain Width (in mm)	L/W Ratio	Thousand Kernel Weight (g)	Moisture content (%)	Ash content (%)
Kiran-95	**7.0**	**3.0**	**2.33**	**49.94**	**10.54**	**1.92**
Amber	**6.2**	**2.9**	**2.13**	**35.60**	**9.5**	**1.85**
Sindh-90	**6.2**	**3.5**	**1.77**	**41.84**	**9.33**	**1.65**
Sarsabz	6.4	3.0	2.13	43.5	9.54	1.87
Khirman	**6.4**	**3.0**	**2.10**	**43.87**	**8.32**	**1.96**
Jauher-18	**6.8**	**3.2**	**2.10**	**46.92**	**10.53**	**2.01**
Mehran-89	**6.3**	**3.0**	**2.0**	**42.64**	**9.46**	**1.8**
Anmol-91	**7.2**	**3.0**	**2.4**	**49.95**	**10.6**	**1.74**
TJ-83	**6.5**	**3.2**	**2.03**	**44.23**	**11.13**	**1.62**
GP-256	**6.1**	**2.9**	**2.10**	**28.06**	**9.4**	**1.91**
GP-205	**6.6**	**3.1**	**2.12**	**45.31**	**9.85**	**1.96**
Marvi	**6.9**	**3.4**	**2.02**	**47.67**	**10.33**	**1.52**
Soghat	**6.3**	**3.7**	**1.70**	**40.51**	**11.63**	**1.62**
Local(unknown)	**6.0**	**3.0**	**2.0**	**35.44**	**9.53**	**1.65**
Mean	**6.41**	**3.13**	**2.06**	**42.53**	**9.97**	**1.79**
Standard deviation	**±0.52**	**±0.24**	**±0.18**	**±6.08**	**±0.85**	**±0.15**
CV	**0.08**	**0.07**	**0.08**	**0.14**	**0.08**	**0.08**

Table 2: Correlation coefficient of different physicochemical parameters

Parameters	Protein	Protein	Protein	Protein	Protein	TKW	TKW
Thousand Weight Kernels (g)	0.600112''						
Moisture content (%)		0.506396					
Ash content (%)			-0.13723				
Grain length(mm)				0.731024'		0.882297''	
Grain Width (mm)					0.113863		0.2063

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