Karnataka J. Agric. Sci., 14(4):(943-946) 2001

Chemical Composition and Functional Properties of Some Important Genotypes of Horsegram *(Macrotyloma uniflorum* Lum Verdc)

JAYASHRI HIREMATH, SUNANDA SHARAN AND K.P. VISHWANATH

Department of Chemistry
University of Agricultural Sciences, GKVK, Bangalore - 560 065

(Received : June, 2000)

Abstract : Investigation was conducted on ten horsegram genotypes to study their chemical composition and functional properties. Results revealed that genotype PHG-9 was found to contain the highest ash, moisture and comparatively high percent of crude fibre. Protein was found to be the highest in PHG-62 and WAC indicating its suitability in preparation of viscous foods like soups, gravies, doughs and bakery products. FAC recorded the highest in PHG-9 both in terms of g/g flour and g/g protein pointing out its flavour retention quality and mouthful feeling.

Introduction

Horsegram is an important pulse crop cultivated mainly as a source of protein in the human diet (Sharma, 1990) and also as livestock fodder (Subbarao and Sampath, 1979). Horsegram assumes greater importance due to its advantages in cultivation practices over other pulse crops since it requires low input grown in marginal rain fed uplands, fairly resistant to the attack of insect pests and diseases. It is less expensive and nutritionally comparable to other pulse crops. Further, the grains also have the medicinal value in dissolving the kidney stones (Thakur, 1979).

Although, new varieties may not always be significantly different from the existing ones in chemical composition, however, it is still imperative to constantly monitor their nutritive value. As mentioned, horsegram is a low cost pulse with high protein with acceptable cooking quality, it has a potential in formulating food products. Since, the functional property plays an important role in the development of any food product, it is essential to determine the functionality to predict its suitability to develop food products. Hence, the present investigation was undertaken to determine the chemical composition and the functional properties of different genotypes of horsegram.

Material and Methods

Ten important genotypes of horsegram grains were obtained from breeder, AICRP on Arid Legumes, GKVK Bangalore, during kharif. The grains were powdered (30 mesh) and analysed for moisture, crude protein, ash, fat, crude fibre sodium, potassium, phosphorus and iron by the methods of Anon. (1980). While phenolics were quantified by the method of Schandri (1970), methionine was estimated by Horn *et al.* (1946). The total carbohydrate was calculated by difference. The functional properties studied in the present investigation were their water absorption capacity (WAC) and fat absorption capacity (FAC) (Sosulski *et al.*, 1976).

Results and Discussion

Table 1 reveals the chemical composition of ten genotypes of horsegram. The moisture content of the varieties ranged from 11.4 to 11.7g %. The varieties KS-2 and PHG-9 had significantly high moisture content compared to

Table 1. Chemical composition of selected genotypes of horsegram

Horsegram Genotype	Moi sture g%	Crude fibre g%	Ash g%	Fat g%	Crude protein g%	Total carb ohyd rate g%	Methio nine mg/g N	Tannin g%	Phosph orus mg%	Pota ssium mg%	Iron mg%	Sodium mg%
B-4-7-1	11.5	5.51	2.80	0.5	20.87	58.82	80.23	1.06	330	338	7.03	11
PHG-13	11.5	5.53	3.06	0.5	20.25	59.15	64.19	1.09	280	290	7.20	12
PHG-62	11.6	5.67	3.19	0.5	23.91	55.13	80.86	1.40	350	361	7.20	13
A-4-6-4	11.5	5.49	2.20	0.5	21.69	58.62	80.69	0.81	350	367	7.00	11
BGM-1	11.6	5.72	2.59	0.5	22.46	57.13	76.88	1.31	260	263	7.20	13
K-42	11.4	5.58	3.12	0.5	23.09	56.31	78.04	0.96	350	398	6.60	15
KS-2	11.7	5.63	2.39	0.5	19.91	59.87	84.01	0.94	270	274	6.80	12
MACINTHOSH	11.5	5.55	2.88	0.5	21.26	58.31	76.47	0.95	320	323	6.90	15
PHG-9	11.7	5.68	3.44	0.5	22.29	56.39	76.96	0.89	420	402	7.20	16
CODB-6	11.6	5.60	2.82	0.5	21.33	58.15	72.72	1.06	320	329	7.20	11
SE	-	0.042	0.009	0.004	0.485	-	0.495	0.005	0.043	-	0.232	-
C.D (5%)	-	0.126	0.029	0.012	1.433	-	1.462	0.017	0.012	-	0.685	-

Mean of triplicates CD = critical difference

other varieties. The crude fibre content of BGM-1, PHG-9, PHG-62, KS-2 AND CODB-6 were found to be significantly high. Ash content in the varieties ranged from 2.2(A-4-6-4) to 3.44 g% (PHG-9). There was significant variation in ash content in all genotypes except B-4-7-1 and CODB-6. The protein content of these horsegram varied ranging from 19.91 to 23.91 g%, PHG-62 and K-42 were found to have significantly high protein content at 23.91 and 23.09 g% followed by BGM-1 and PHG-9 at 22.46 and 22.29 g% respectively and the lowest in KS-2 at 19.91 g%. The protein content in the varieties analysed are comparable to those reported by Preeti *et al.* (2000). Although KS-2 had the lowest protein content, its methionine content per g nitrogen was found to be significantly high. Iron content was found to be the highest in PHG-9, PHG-13, BGM-1 and CODB-6 and the lowest in PHG-62 and K-42.

Phophorus content of horsegram varieties ranged from 420 (PHG-9) to 260 mg % (BGM-1). Sodium and Potassium content in PHG-9 was found to be the highest followed by K-42 compared to other varieties. Tannin content was found to be significantly high in PHG-62 at 1.4 g%. The other genotypes BGM-1 and PHG-13 were found to have as high as 1.31 and 1.09 g% of tannin compared to other genotypes studied. The yield, protein, water absorption capacity and fat absorption capacity values are presented in table-2. WAC ranged highest at 1.41 in PHG -62 followed by K-42 and PHG-9 at

Table 2. Yield, protein, water absortion capacity and fat absorption capacity of selected genotypes of horsegram

Genotype	Yield kg/ha	Protein g/100g	Water absorption capacity		Fat absorption capacity	
			g/g flour	g/g Protein	g/g flour	g/g Protein
B-4-7-1	655	20.87	1.29	6.18	0.7393	3.54
PHG-13	938	20.25	1.30	6.42	0.7300	3.65
PHG-62	795	23.92	1.41	5.89	0.7960	3.33
A-4-6-4	792	21.69	1.35	6.22	0.8500	3.93
BGM-1	928	22.46	1.33	5.92	0.7400	3.29
K-42	785	23.09	1.40	6.06	0.7390	3.20
KS-2	509	19.91	1.35	6.78	0.76780	3.85
MACINTHOSH	898	21.26	1.25	5.87	0.8000	3.68
PHG-9	1291	22.29	1.39	6.24	0.9100	4.08
CODB -6	955	21.33	1.30	6.093	0.7900	3.73
SEm±	-	-	0.022705	-	0.027162	-
CD(5%)	-	-	0.66980	-	0.080126	-

CD = Critical difference.

1.40 and 1.39 g/g of flour respectively. The lowest WAC was recorded in Macinthosh at 1.25 g/g of flour. But when WAC expressed on crude protein basis KS-2 had the highest value followed by PHG-13 and PHG-9. Water binding capacity is an important function of protein in viscous food soups, gravies, doughs, baked products (Kensella, 1976, Padmashree *et al.*, 1987).

Fat absorption capacity (FAC) was found to be highest in PHG-9 (0.91 g/g of flour) followed by A-4-6-4 (0.85g/g of flour) and the lowest in PHG-13 (0.73g/g of flour). FAC has been attributed to the physical entrapment of oil. FAC enhances flavour retention and improves mouthful feeling (Kensella, 1976).

It is evident from the results that genotypes PHG-9, PHG-13, K-42, KS-2, and CODB-6 were found to be comparatively superior in terms of chemical composition, while PHG-9 PHG-62, PHG-13 and A-4-6-4 genotypes scored higher functional properties. Thus, it can be concluded that genotypes PHG-9, PHG-13, PHG-62 are chemically and functionally superior compared to other genotypes. Yieldwise PHG-9 ranked first (1291 kg/ha) followed by CODB-6 (955 kg/ha), PHG-13 (938 kg/ha) and BGM-1 (928 kg/ha) (Table 2).

References

ANONYMOUS, 1980, *Official methods of analysis of the Association of Official Analytical Chemists.* 13th Edition, Washington, D.C.

HORN, M.J., JONES, D.B., and BLUM, A.E., 1946. *Journal of Biological Chemistry,* 166:313.

KENSELLA, J.E., 1976, Functional Properties of Proteins in Food. *Critical Review of Food Science and Nutrition.*

PADMASHREE, T.S., VIJAYALAKSIM L., AND PUTTARAJ, S., 1987, *Journal of Food Science and Technology,* **24**:221-225.

PREETI, D., AMEETHA, K., and KUSHWAH H.S., 2000, Electrophoretic fractionation of water soluble proteins of raw and processed horsegram. *Indian Journal of Nutrition and Dietetics,* **37**:28-34.

SCHANDRL, S.H., 1970, *Methods in Food Analysis.* Academic Press, New York, 709.

SHARMA, C.M., 1990, Protein and mineral composition in horsegram. *Journal of Research,* Bihar Agricultural University, **2**:129-13.

SOSULSKI, F., HAMBERT, E.S., BERR, K., AND JONES, J.D., 1976, Functional Properties of rape seed flour concentrates and isolate. *Journal of Food Science,* **41**:1349.

SUBBARAO, A., AND SAMPATH, S.R., 1979, Chemical composition and nutritive value of hoursegram. *Mysore Journal of Agricultural Sciences,* **13**:198-205.

THAKUR, C., 1979, *Scientific Crop Production.* Book Company Private Limited, New Delhi, 3rd Edition, 319.