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NUTRITIONAL QUALITY OF DIFFERENT GENOTYPES OF GRAIN LEGUMES IN UTTARAKHAND

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Abstract: Sixteen pulses genotypes comprising four of each of the six crops namely Gram (PG 043, PG 065, PG 114, PG 186), Lentil (PL 5, PL 6, PL 7, PL 8), Blackgram (PU 30, PU 31, PU 35, PU 40), Greengram (PM 2, PM 3, PM 5, PM 6,) Fieldpea (Pant Pea 13, Pant Pea 14, Pant Pea 42, Pant Pea 72) and Pigeonpea (PA 3, PA 291, PA 374, UPAS 120) were compared for their nutritional quality parameters. The tested genotypes of the different pulses differ in seed colour ranging from pinkish white to red. The nutritional quality viz. protein content, fat content, moisture content and ash content of the tested genotypes also differed with pulses. Nitrogen content of different pulse genotypes ranged from 2.896 to 4.176 %, highest being with blackgramgenotype PU 35. The protein content of the evaluated genotypes ranged from 18.1 to 26.1%. Blackgram genotypes indicated relatively more protein of 24.4 to 26.1% as compared to other pulses. Ash content in pulses genotypes ranged from 3.170to 4.925 %. Fieldpea genotypes exhibited relatively higher ash content of 4.252 to 4.925 % than other genotypes. The moisture content in seed was minimum of 10.5 % of PU30 and maximum 16.1 % in Pant Pea 14. The different pulses exhibited wide variations in fat content from 1.0 % (Lentil PL6) to 7.4 (Gram PG 065). The different gram genotypes recorded relatively higher fat content of 6.3 to 7.4 % as compared to the genotypes of other pulses.

Keywords: Pulses genotypes, Seed colour, Nitrogen content, Protein, Moisture, Fat, Ash content.

INTRODUCTION

Pulse crops are integral component of Indian agriculture. These are an important source of protein for the poor as well as for the vegetarians, which constitute major population of the country (Mahajan and Chattopadhyay, 2000). The major pulses cultivated in India are Chickpea (*Cicer arietinum*), Pigeonpea (*Cajans cajan*), Greengram (*Vigna radiata*), Blackgram (*Vigna mungo*), Fieldpea (*Pisum sativum*) and lentil (*Lens culinaris*) and consumed in various forms, as whole seed, in split form, or after removal of certain component parts, the seed coat and embryo (Singh and Singh, 1992; Jukanti *et al.,* 2012). The split grains of pulses called *dal* are excellent source of high quality protein, essential amino and fatty acids, fibers, minerals and vitamins. Pulses have a high protein content ranging

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from 20-40%, contain no cholesterol and little fat. Pulses also provide iron, magnesium, phosphorus, zinc and other minerals, which play a variety of roles in maintaining good health (Xu *et al.* 2007). Earlier reports suggested that nutritional quality of pulses differs with genotypes and soil and crop management factors. Development of high yielding and multiple diseases and pest resistant genotypes of pulses is important aspect for breeding programme in the country. The breeding programme for crop improvement generally requires larger variations among the genetic materials to be used for breeding purposes, it is expected that the developed genotypes will differ in nutritional and chemical compositions of pulses grains. A large number of pulses genotypes have been generated in recent past (Ali *et al*., 2004). Since, little or no information is available on the nutritional quality of the recently developed pulse genotypes, the present study was undertaken to assess the nutritional variations in different genotypes of pulse genotypes grown in Uttarkahnd.

MATERIALS AND METHOD

The present study was conducted in the department of Home and Food Science laboratory at SAPKM, Kichha, district Udham Singh Nagar. The pulse grain samples of Gram (PG 043, PG 065, PG 114, PG 186), Lentil (PL 5, PL 6, PL 7, PL 8), Blackgram (PU 30, PU 31, PU 35, PU 40), Greengram (PM 2, PM 3, PM 5, PM 6,) Fieldpea (Pant Pea 13, Pant Pea 14, Pant Pea 42, Pant Pea 72) and Pigeonpea (PA 3, PA 291, PA 374, UPAS 120) were obtained from Pulse Breeding Section at N.E. Borlaug Crop Research Centre, G. B. Pant University of Agriculture and Technology, Pantnagar. The shape of the obtained grains was recorded visually and grain colour by comparing with the different colour chips in Munsel Book of colour (Munsel Colour Co. Inc., Baltimore, Maryland, USA). Moisture content was determined gravimetrically by drying the 5 g sample of each genotype in hot air oven at 110 °C for 3 h to constant weight. Ash content was by burning the grain sample in a Muffle furnace at 600°C for 3 h. (AOAC, 1990). The obtained pulse grain samples were finely grind (40 mesh) by mixer grinder after washing in sequence, first in detergent solution (0.2 per cent liquid detergent), then in dilute HCl (0.1 N HCl solution) and finally twice in deionised water. The total N content in the grain samples was determined using Automatic rapid N Cube analyzer (Elementar, Grmeny) and protein content in the grains was computed by multiplying the per cent N content with 6.25 as described by Lowry *et. al.,* (1951). Oil from the grind samples (2 g) was extracted in a Soxhlet apparatus with n-hexane for 16 hrsand fat percent of the sample was calculated (AOCS, 1981).

RESULTS AND DISCUSSION

Colour and Shape

The different genotypes of the pulses differed in grain colour (Table 1). Pea genotypes varied from pinkish white (Pant pea 13, Pant pea 42) to very pale brown (Pant 14, Pant pea 74) in colour. The gram varieties showed colour from light reddish dark brown (PG 186) to dusky red (PG 65). The blackgram genotypes showed colour of very dark brown grey (PU 30 and PU 35) to very dark grey (PU 31 and PU 40). The colour of greengram varieties ranged from olive (PM 3 and PM 5) to dark brown (PM 2). The colour of lentil genotypes differed from pink (Pl 6) to brown (PL 8). The colour of pigeon genotypes PA3, PA 374 and UPAS 120 was red and PA 291 was dark red. The shape of different pulses was observed as oval, round and circular. Shape and colour of the genotypes is intrinsic characteristics of the crop varieties and depends on genetic composition (Vandenberg and Slinkard, 1990). Similar variations in seed coat color have been reported in legumes including some lentil varieties (Xu *et al.*, 2007).

Nutritional characteristics

The moisture content in different pulses varied with their genotypes ranging from 10.5% (PU 30) to 16.1% (Pant Pea 14) (Table 2). The Gram and Pea genotypes have relatively more moisture than the tested genotype of other pulses. Protein content in tested genotypes of the pulses varied from 18.1% (Pant Pea 42) to 26.1% (PU 35). The blackgram genotypes had relatively more protein content (24.4% - 26.1%) compared to other pulses. The protein content of Gram genotypes vary from 20.3% to 25.1%, field pea genotypes from 18.1 to 20.4%, greengram genotypes from 19.8 to 24.2%, lentil genotypes from 18.2 to 20.2 % and pigeonpea genotypes from 20.4 to 23.3%.Similar differences in seed protein content of different legumes have been reported earlier (Chitra *et al*., 1995; Duranti and Gius, 1997). Such trends in protein content were related with seed nitrogen content. Ash content differed in pulses with their genotypes maximum being 4.925% in pea variety Pant Pea 42 and minimum of 3.17% in Arhar variety PA 374. The fat content in different genotypes of the tested pulse crops ranged from 1.0 to 7.4 %. All the genotypes of Gram have more fat content (6.3%-7.4%) than the different genotypes of fieldpea, greengram, lentil, pigeonpea and blackgram (1.0% - 2.1%). Similar variations in nutritional benefits such as ash content and fat content of pulses genotypes have been reported by Solanki *et al.*, (1999), Gaur *et al.,* (2012) and Tiwari and Singh (2012).

Results of the study indicated that different pulses and their genotypes differ considerably in various nutritional parameters. The blackgram genotypes were better in protein and gram gram genotypes in fat. Among the tested genotypes, PU 35 of blackgram and PG 065 of gram were found best for protein and fat content, respectively.

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Table 1. Colour of different Pulses genotypes

Crop	Genotype	MunselColour (Hue, Value, Chroma)	Colour
Gram	PG043	7.5YR 5/4	Brown
	PG065	10R 3/3	Dusky Red
	PG114	7.5 YR 5/6	Strong Brown
	PG186	2.5YR 6/4	Light Redish dark Brown
Fieldpea	Pant Pea 13	5YR 8/2	Pinkish White
	Pant Pea 14	10YR 8/3	Very Pale Brown
	Pant Pea 42	7.5YR 8/2	Pinkish White
	Pant Pea 74	10 YR 8/4	Very Pale Brown
Blackgram	PU 30	10YR 2/2	Very Dark Brown
	PU 31	10 YR 3/1	Very Dark Gray
	PU 35	10 YR 2/2	Very Dark Brown
	PU 40	10 YR 3/1	Very Dark Gray
Greengram	PM 2	7.5 YR 4/4	Dark Brown
	PM 3	5 Y 5/6	Olive
	PM 5	5 Y 5/4	Olive
	PM 6	5 Y 6/6	Olive Yellow
Lentil	PL 5	2.5YR 5/6	Red
	PL 6	5YR 7/4	Pink
	PL 7	5YR 6/4	Light Reddish Brown
	PL 8	10YR 5/3	Brown
Pigeonpea	PA 3	10 R 4/6	Red
	PA 291	2.5 YR 3/6	Dark Red
	PA 374	2.5 YR 4/8	Red
	UPAS 120	10 R 4/6	Red

Table 2. Nutritional value of different genotypes of pulse crops grown in Uttarakhand

Pulse	Genotype	Nitrogen content (%)	Protein (%)	Ash (%)	Moisture (%)	Fat (%)
Gram	PG 043	3.568	22.3	3.412	15.4	6.3
	PG 065	3.696	23.1	3.211	14.9	7.4
	PG 114	4.016	25.1	3.474	15.7	6.8
	PG 186	3.248	20.3	3.529	14.5	6.9
Fieldpea	Pant Pea 13	3.168	19.8	4.252	14.3	1.3
	Pant Pea 14	3.264	20.4	4.614	16.1	1.2
	Pant Pea 42	2.896	18.1	4.925	14.5	1.3
	Pant Pea 74	3.104	19.4	4.514	14.7	1.5
Blackgram	PU 30	4.064	25.4	3.725	10.5	1.7
	PU 31	3.968	24.4	3.416	12.2	1.7
	PU 35	4.176	26.1	4.205	13.1	1.7
	PU 40	4.08	25.5	4.156	10.7	1.6
Greengram	PM 2	3.168	19.8	3.86	13.5	1.5
	PM 3	3.408	21.3	3.94	11.6	1.5
	PM 5	3.872	24.2	4.25	10.7	1.6
	PM 6	3.536	22.1	4.24	13.9	1.7
Lentil	PL 5	2.96	18.5	3.52	13.6	1.1
	PL 6	3.088	19.3	3.626	14.7	1.0
	PL 7	3.168	19.8	3.714	15.1	1.2
	PL 8	3.232	20.2	3.512	14.2	1.1
Pigeonpea	PA 3	3.44	21.5	3.74	11.17	1.7
	PA 291	3.264	20.4	3.38	12.10	2.1
	PA 374	3.552	22.2	3.17	11.47	1.9
	UPAS 120	3.728	23.3	3.50	10.57	1.8