PHYTOCHEMICAL CONTENT OF BLACK SEEDED BEAN CULTIVARS AFTER COOKING AND FRYING

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Seed of different bean cultivars have been included in diets and tested in rats with induced diabetes and colon cancer to determine the effects of their consumption on the control of these diseases. Outstanding cultivars were Pinto Zapata and black seeded Negro 8025 (1). Phytochemical characterization is essential to study the effect of bean consumption on colon cancer and diabetes. Such information could guide us on identifying which seed component(s) are involved in the biological effect. In Mexico, all the commercial classes of dry beans that are produced are consumed cooked or refried; therefore, the objective of this study was to determine the effect of such processes on the phytochemical profile of black bean cultivars. Black seeded beans constitute the largest consumed commercial class in Mexico, grown mostly in the central and southeast regions.

MATERIAL AND METHODS

After cooked, broth and seeds were lyophilized, samples were divided for biochemical determinations and for refrying; refried beans were then analyzed. Total phenolics were determined according to literature (2), as well as total tannins (3) and total anthocyanins (4). Tested bean genotypes included bred cultivars and lines as well as landraces Negro San Luis, Negro Zacatecas and Negro Queretaro; these three belong to the Jalisco race and are shiny seeded, as is cv. Negro Otomi. The rest of the genotypes are opaque seeded from the Mesoamerican race.

RESULTS

Phenolic compounds. As expected, the content of these compounds was high in row seed and without exception diminished after cooking and refrying (Table 1). The extent of reduction was different among genotypes, however. Negro Otomi and Negro San Luis (shiny seeded) and line NGO 99176 (opaque) displayed the lowest contents after refrying, whereas Negro Zacatecas (shiny) showed the highest. The variation found among genotypes was large (5) and could be utilized in breeding, however the stability of these compounds after cooking and refrying must be considered.

Table 1. Total phenolics (mg/100 g whole seed) in row, cook and refried grain of black seeded bean genotypes.

Genotype	Raw bean	Cooked bean	Refried bean
(Ng INIFAP/8025)-100	503,2	402,9	306,7
NG0 99176	1020,5	286,4	117,0
NG0 99038	1118,0	711,4	262,4
(NSLB/8025/N203)-201	852,7	676,0	282,0
(NSLB/8025/N203)-250	979,6	210,9	301,1
Negro Michigan (1)	805,6	347,2	213,6
Negro Michigan (2)	803,2	486,8	320,6
T-39	682,8	377,7	380,3
Negro 8025	1089,4	257,9	401,9
Negro Durango	1059,3	457,5	371,9
Negro Jamapa	672,5	351,9	310,8
Negro Querétaro	713,4	390,3	383,7
Negro Otomí	688,0	377,6	126,6
Negro San Luis	601,5	376,6	171,8
Negro Tacana	572,6	342,9	356,9
Negro Zacatecas	1062,3	612,5	519,8

Anthocyanins content: Row beans displayed higher content, while refried beans the lower. Therefore, the processes of cooking and refrying caused a generalized reduction in content, although non-uniform across genotypes. NGO 99038 showed the highest content after being cooked followed by a sample of Negro Michigan purchased in Queretaro and T-39 harvested in Celaya. All the shiny seeded genotypes displayed relatively high contents. After being refried T-39 displayed the highest content followed by Negro Zacatecas (shiny), Negro 8025 (opaque) and Negro Jamapa (opaque). The five-bred lines displayed low content after refrying than the rest of the tested genotypes. It may be worth to conduct these determinations before releasing a cultivar or even just testing for the loss of pigments in soaking water.

Tannin content: Tannins were readily reduced with cooking and refrying, and even after conducting these processes a large variation was observed among genotypes. Similar variation was reported among black seeded bean genotypes (5, 6).

CONCLUSIONS

Cooking and refrying diminished the content of most phytochemicals, and regardless of preparation, there was large variation among bean genotypes; variation that can be utilized in breeding better cultivars.

Table 2. Anthocyanins and tannin contents (mg/100 g whole seed) in raw, cook and refried grain of 16 black seeded bean genotypes.

	Anthocyanins			Tannins		
Genotype	Raw bean	Cooked bean	Refried bean	Raw bean	Cooked bean	Refried bean
NI/8025)-100	76,8	1,7	0,3	1016,7	25,5	38,4
NG0 99176	84,1	2,6	0,1	1067,6	13,3	45,5
NG0 99038	102,7	54,8	0,4	1197,6	68,8	34,9
(NSLB/8025/N203)-201	62,5	8,7	0,8	1471,2	32,1	70,2
(NSLB/8025/N203)-250	105,7	14,9	0,2	1413,2	46,1	31,4
Negro Michigan 1	99,2	12,1	15,5	351,0	6,7	53,7
Negro Michigan 2	58,1	47,5	31,1	444,6	6,7	25,5
T-39	71,8	43,8	39,8	38,6	39,6	38,4
Negro 8025	54,1	29,3	29,8	881,2	38,4	74,9
Negro Durango	84,5	24,0	17,6	1170,0	132,4	31,4
Negro Jamapa	42,7	15,9	28,3	11,1	47,8	40,8
Negro Querétaro	62,7	34,3	22,8	408,4	47,8	31,4
Negro Otomí	42,8	25,8	14,2	770,5	59,5	23,1
Negro San Luis	81,7	33,3	11,2	155,0	44,3	1,96
Negro Tacana	48,7	6,9	9,5	14,0	36,0	1,96
Negro Zacatecas	64,8	42,6	32,9	1233,2	53,7	31,3

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