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Effect of Germination on the Mineral Composition of Chickpea (*Cicer arietinum*) Varieties

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INTRODUCTION

Legumes are the most commonly used plant food materials in our country. Legumes comprise a large group of foods. The term pulse, bean and legume are commonly used to designate the decorticated or whole seeds of leguminous plants. They are the primary source of dietary proteins and other nutrients. But the legumes have the limitation that they have to be cooked for a prolonged period to make them digestible and palatable. However, germination increases the digestibility, shortens the time needed for cooking and enhances the nutritive value of the legumes, due to an interplay of enzymes (Giri et al., 1981).

Chickpea (Cicer arietinum) is the most important pulse crop in India from production and consumption point of view. Chickpea is an important source of protein in several developing countries. Among the world's grain legumes, chickpea is second to dry beans in cultivated area and third in production to dry beans and dry peas. Chickpeas are of two basic types: *kabuli* and *desi*. *Kabuli* seeds are generally large and light coloured, while *desi* seeds are yellow black and are generally smaller with a rough surface. The *kabuli* types are grown mainly in the Mediterranean countries whereas the desi types predominate in the Indian subcontinent (Singh et al., 1991). In fact, India accounts for over 70 per cent of the world's total production and consumption of chickpea (ICRISAT 1993). Since processing is a pre-condition for the consumption of legumes, including chickpea, mineral composition of germinated chickpea was investigated in this study.

MATERIAL AND METHODS

Procurement of Materials: The seeds of two cultivars (HPG-17 and C-235) of chickpea were procured in a single lot from the Department of Plant Breeding and Genetics, Himachal Pradesh Krishi Vishvavildyalaya (HPKV), Palampur.

Preparation of Samples: The seeds were cleaned of dust and dirt. Cracked and broken seeds and other foreign materials were hand picked out and discarded. Raw seeds were ground in an electric food processor grinder and packed in air tight plastic containers for further analysis.

Germination: The well cleaned samples of both chickpea varieties, HPG-17 and C-235 were soaked in water overnight. The excess water was drained off and soaked samples of each variety were incubated for 48, 72 and 96 h in the B.O.D incubator (22°C) and at room temperature (18.2-29.5°C). After requisite incubation period, the samples were dried at 60+5°C in the tray drier and then ground and thereafter, stored in containers to equilibrate the moisture for further use in the investigation.

Nutritional Evaluation of Chickpea: The germinated samples were analysed for the mineral composition. The acid digestion was done as per the method of Piper (1950). The iron, calcium and potassium content was estimated according to the method of Lindsey and Norwell (1969) by the Atomic Absorption Spectrophotometer (Varian AA-175 series) and Flame Photometer.

Statistical Analysis: Data on the mineral composition were subjected to analysis of variance technique following completely randomised design. The significant differences between samples were tested using the F-test and t-test (Panse and Sukhatme, 1961).

RESULTS AND DISCUSSION

The mineral composition of the germinated samples of HPG-17 and C-235 varieties of chickpea in relation to their germination

methods and duration of germination are presented in tables 1 and 2.

Table 1: Effect of germination methods on mineral composition of chickpea varieties

Variety	*Germination Method*	*Calcium*	*Iron*	*Potassium*
HPG-17	Raw	250.38	12.23	518.35
	Incubator	237.05	10.24	505.98
	Room temperature	236.29	10.17	505.25
C-235	Raw	231.67	10.34	480.27
	Incubator	219.57	8.15	465.21
	Room temperature	218.56	8.10	464.84
CD (P<0.05)		1.740	0.026	2.260
S.E.		6.056	0.009	0.789

Values are mg per 100 g on dry weight basis

Table 2: Effect of germination methods and its duration on mineral composition of chickpea varieties

Germination Method	*Duration (hr)*	*Calcium*	*Iron*	*Potassium*
Incubator	48	232.35	9.47	486.02
	72	229.44	9.18	485.53
	96	223.14	8.95	485.22
Room temperature	48	232.04	9.40	485.62
	72	228.69	9.10	485.62
	96	221.53	8.91	484.65
CD (P<0.05	2.130	0.030	2.770	
S.E.	0.740	0.011	0.966	

Values are mg per 100 g on dry weight basis

The method of germination had a non-significant effect on the calcium and potassium content of germinated chickpea cultivars, however, the iron content varied significantly in both the varieties. The value of calcium and potassium contents was obtained as 237.05 and 505.98 mg, respectively per 100 g in incubator germinated HPG-17 variety and the iron content was obtained as 10.24 mg per 100 g. In case of C-235 the calcium and potassium content was 219.57 and 465.21 mg, respectively per 100 g in incubator germinated samples and the iron content 8.15 mg per 100 g. However, the room temperature germinated samples had lower content of calcium, iron and potassium than incubator germinated samples in both HPG-17 and C-235 varieties.

The germination period and method of germination also had significant effect on the calcium and iron contents and varied non-significantly in case of potassium. The calcium, iron and potassium contents decreased in both incubator and room temperature germinated samples as the germination progressed compared to the control (raw) values. However, the mineral content was found to be higher in incubator germinated samples compared to room temperature germinated samples. Geervani and Theophilus (1980) reported iron content in bengal gram (desi chickpea) as 10.6 mg per 100 g. Gulati and Sood (1998) reported the calcium and potassium content in desi chickpea cultivars ranging from 216.00-296.00 and 504.16 to 564.44 mg per 100 g, respectively. Akinlosotu and Akinyele (1991) observed a decrease in calcium and iron content during germination. The present findings corroborate these earlier observations and provide such new data on both the varieties of chickpea.

KEY WORDS Germination. Calcium. Iron. Potassium. Chickpea. Incubator. Room Temperature.

ABSTRACT Chickpea, the most important food legume of dry-land agriculture, is a good source of protein and carbohydrates etc. In the present investigation two cultivars of chickpea namely HPG-17 and C-235 were germinated at room temperature and in incubator for different periods were evaluated for the mineral composition. In both the varieties the mineral content decreased after germination when compared with the raw values. However, the HPG-17 variety was found to be better compared to C-235 variety.

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