Asian Journal of Home Science (June, 2010) Vol. 5 No. 1 : 90-93

Research Paper :

Chemical composition of garlic powder using different drying methods

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Accepted : *February, 2010*

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ABSTRACT

Commonly used garlic (*Allium sativum* L.) was dried by shade, solar, oven and microwave drying methods. Sensory analysis indicated that all the dried garlic powders were in the category of '*liked moderately*'. Proximate composition varied from 0.78% to 8.87% and mineral content ranged from 0.29 to 86.50 mg/100g. Polyphenol content was almost similar in all the dried garlic powders whereas β-carotene and ascorbic acid contents were maximum in shade dried garlic powders *i.e.* 0.69 and 5.39 mg/100 g, respectively.

Key words : Garlic powder, Sensory analysis, Nutritional evaluation, β-carotene, Ascorbic acid, *Allium sativum* L.

Garlic (*Allium sativum* L.) is the second most widely cultivated spice and used allium next to onion. India ranks third in production of garlic (4.30 lakh tonnes), next to Korea and china (Kumaran *et al.,* 2008). It is grown throughout the plains of India and used by large segment of population in various forms. Fresh garlic have distinct aromatic odour and pungency which are seldom carried over to the processed products. Garlic pickle, powder, paste, flavour and flakes are a few value added products. Encapsulated garlic powder, flavour and volatiles are also being exported now (Joshi *et al.,* 1998). Some are added to improve texture and to introduce a palatable colour or odour and to improve the shelf-life of food. Garlic has potential medicinal values. Besides, colouring and flavouring material also indirectly used as preservative in many pharmaceutical preparations (Lamikanra, 2002). It has also been recognized to possess several medicinal properties (diuretic, expectorant, laxative, anti-bacterial, anti-spasmodic, anti-dyspeptic, anti-flatulent, anti-pyretic, etc.) and have been effectively used in the indigenous systems of medicine in India as well as in other countries. Apart from the traditional use, a host of beneficial physiological effects have been brought to the fore by extensive animal studies. Garlic has beneficial influences on lipid metabolism (Srinivasan *et al*., 2004), efficiency as anti-diabetics (Srinivasan, 2000), and ability to stimulate digestion due to their carminative properties. Its extracts have been found to beneficially inhibit platelet aggregation (Srinivasan, 2005). Garlic is fair source of vitamins and minerals. The garlic that is dried is not very similar to the fresh garlic for culinary purposes. The fresh garlics are more susceptible to mould attack, especially after preparation for market. But by making powder of garlic, it is very convenient to store it for a period of one or two weeks for day to day use in the kitchen, especially for flavoring *Biriyani* and meat preparations. Considering importance of garlic powder, an attempt was made to develop garlic powder and its nutritional evaluation was carried out.

METHODOLOGY

Garlic (*Allium sativum* L.) was procured from the local market of Hisar city for experimental work. Blanching and sulphiting : To improve the colour and shelf-life, garlics were subjected to blanching by steeping in boiling water for 10-15 seconds and then immersing in 0.2 per cent KMS solution for 5 minutes at room temperature (Singh *et al.*, 1997). Treated garlics were chopped into small pieces and dried by four different drying methods.

– Shade drying:- Garlics were dried in shade at room temperature.

– Oven drying:- Garlics were dried in oven at 50 ± 5^0C temp. for 6-8 hrs.

– Microwave drying:- Garlics were dried in microwave of 800 W power for 3 to 4 minutes.

– Solar drying:- Garlics were dried in hot air solar dryer at 54^0 C temp. for 6-8 hrs.

Dried garlic pieces were ground in grinder to make fine powder. The sensory quality of the developed powders in respect of colour, appearance, flavour and texture was judged by panelists using 9- point hedonic

scale (Lawless and Klein, 1991). Moisture content, protein, crude fibre, fat, ash, β-carotene and vit. C in the sample were estimated by employing the standard method of analysis (AOAC, 1995). Antinutrient polyphenol was estimated by the method of Singh and Jambunathan (1981). Total calcium, iron and copper contents were determined by atomic absorption spectrometer 2380, Perkin Elmer (USA) according to the method of Lindsey and Norwell (1969). Data were analyzed using complete randomized design and factorial complete randomized design.

FINDINGS AND DISCUSSION

The findings obtained from the present investigation are presented below:

Sensory analysis:

The shade, solar, oven and microwave dried garlic powders were organoleptically acceptable by the panelists (Table 1). Mean scores for colour, appearance, flavour and texture ranged from 7.30 to 7.50, 7.20 to 7.30, 7.00 to 7.40 and 7.10 to 7.30, respectively. When overall acceptability of all the garlic powders was compared, the microwave dried garlic powder scored slightly more (7.50) followed by powder prepared from garlic dried in solar dryer (7.40). Mean scores indicated that garlic powders prepared using different drying methods were in the category of '*liked moderately*'. Datta *et al.* (2003) also reported that colour of shade dried garlic cloves was '*liked very much*' by the judges.

Moisture content of garlic powder ranged from 3.26% to 3.55%. Non-significant difference (P<0.05) was observed in moisture content of garlic powder dried using different drying methods (Table 2). Similar results for moisture content in the oven dried garlic powder have been reported earlier by Rathor and Mathur (2001).

Protein content varied form 7.87% in oven dried garlic powder to 8.87% in shade dried garlic powder. Protein content of dried garlic powder using different drying methods was almost similar to each other. Pande *et al.* (1994) in an earlier study also reported almost similar protein content in shade dried garlic powder *i.e.* 9.27%. Crude fibre, fat and ash contents of garlic powder dried in shade, solar dryer, oven and microwave ranged from 4.49 to 4.86, 0.78 to 0.92 and 3.36 to 3.73%, respectively on dry weight basis Table 2. The results obtained for crude fibre, fat and ash content of garlic powder are in close agreement with those reported earlier by Pruthi (1988) and Gopalan *et al.* (2004).

β-carotene and ascorbic acid contents of garlic powder prepared by different drying methods were found to be maximum in shade dried samples *i.e.* 0.69 and 5.39 mg/100 g and minimum in solar dried garlic powder *i.e.* 0.52 and 3.92 mg/100 g, respectively (Table 3). Sharma (1993) has also reported lower values for β- carotene and ascorbic acid in solar dried garlic powder. This might be due to exposing the sample for longer period in the solar dryer (approximately 10-12 hours).

Polyphenol contents varied from 13.89 mg/100 g in shade dried garlic powder to 14.78 mg/100g in microwave dried garlic powder. Data showed that drying method had no effect on polyphenol content of garlic powder prepared using different drying methods *i.e.* shade, solar, oven and microwave. Bawa *et al.* (2007) also reported almost

Table 1 : Organoleptic acceptability of garlic powder prepared by different drying methods

Garlic powder	Colour	Appearance	Flavour	Texture	Overall acceptability
Shade dried	7.30±0.15	7.30±0.09	7.00±0.00	7.10±0.18	7.20±0.09
Solar dried	7.50±0.16	7.20±0.16	7.20±0.16	7.30±0.15	7.40±0.08
Oven dried	7.40±0.13	7.20±0.13	7.20±0.13	7.20±0.10	7.20±0.10
Microwave dried	7.40±0.16	7.30±0.16	7.40±0.16	7.30±0.15	7.50±0.08
C.D. (P=0.05)	0.37	0.35	0.48	0.42	0.39

Values are Mean ± SE of ten observations

Table 2 : Proximate composition of garlic powder prepared by different drying methods (per cent, dry matter basis)

Garlic powder	Moisture	Protein	Crude fibre	Fat	Ash
Shade dried	3.55±0.05	8.87±0.09	4.78±0.06	0.92±0.08	3.51±0.08
Solar dried	3.35±0.05	8.42±0.10	4.49±0.08	0.78±0.05	3.36±0.06
Oven dried	3.26±0.08	7.87±0.08	4.62±0.07	0.84±0.06	3.62±0.07
Microwave dried	3.32±0.03	8.73±0.11	4.86±0.06	0.87±0.07	3.73±0.04
C.D. (P=0.05)	0.28	0.90	0.20	0.17	0.25

Values are Mean ± SE of three replicates

Table 3 : β-carotene, ascorbic acid and polyphenol contents (mg/100g) of garlic powder prepared by different drying methods (dry matter basis)

Garlic powder	β-carotene	Ascorbic acid	Polyphenols
Shade dried	0.69±0.04	5.39±0.13	13.89±0.15
Solar dried	0.52±0.03	3.92±0.08	14.52±0.12
Oven dried	0.59±0.05	4.02±0.06	14.68±0.11
Microwave dried	0.62±0.07	5.10±0.15	14.78±0.13
C.D. (P=0.05)	0.01	0.06	0.97

Values are Mean ± SE of three replicates

Table 4 : Total calcium, iron and copper contents (mg/100g) of garlic powder prepared by different drying methods (dry matter basis)

Garlic powder	Calcium	Iron	Copper
Shade dried	84.21±1.25	0.55±0.03	0.48±0.05
Solar dried	81.30±1.42	0.38±0.04	0.29±0.02
Oven dried	80.41±1.35	0.44±0.06	0.35±0.05
Microwave dried	86.50±1.28	0.52±0.05	0.31±0.02
C.D. (P=0.05)	2.45	0.16	0.14

Values are Mean ± SE of three replicates

similar polyphenol content *i.e.* 14.97 mg/100g in oven dried garlic powder.

Total calcium, iron and copper content of garlic powder prepared using shade, solar, oven and microwave drying methods ranged from 80.41 to 86.50, 0.38 to 0.55 and 0.29 to 0.48 mg/ 100g, respectively (Table 4).

Conclusion:

From the above study we can conclude that garlic powders prepared using shade, solar, oven and microwave drying methods have good sensory and nutritional profile. When market rates of garlic are fluctuating, we can make powder of it and can use in many culinary preparations in the off-season also. It saves our precious time, money and energy.

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REFERENCES

AOAC (1995). *Official Methods of Analysis*. Association of official agricultural chemists, Association of Analytical Chemists, Washington, D.C.

Bawa, A.S., Khanum, F., Saritha, V. and Kumar, A. (2007). Effect of cooking on total phenols, flavonoids and antioxidant activity in spices of Indian culinary. *J. Food Sci. Technol.,* **44** (4) : 357-359.

Datta, A.K., Prasad, S. and Sharma, G.P. (2003). Drying kinetics of garlic cloves under convective drying conditions. *J. Food Sci. Technol.,* **40** (1) : 45-51.

Gopalan, C., Ramasastri, B.V. and Balasubramanium, S.C. (2004). Nutritive value of Indian foods. NIN, ICMR, Hyderabad. pp. 48-50.

Joshi, G.J., Giridhar, N. and Satyanarayana, A. (1998). Studies on preparation and storage of ginger- garlic paste. *Indian Food Packer*, **14** : 170-175.

Kumaran, G.S., Rathinakumari, A.C and Mandhar, S.C. (2008). Innovative machinery for garlic peeling. *Indian Food Packer,* **68** : 190-198.

Lamikanra, O. (2002). Fresh-cut fruits and vegetables : Science, Technology and Market. Boca Raton, FL : CRC Press. pp. 1-43.

Lindsey, W.L. and Norwell, J.A. (1969). A new DPTA-TEA soil test for zinc and iron. *Agron. Abstr.,* **61** : 84.

Lawless, H.T. and Klein B.P. (1991). *Sensory Science Theory and Applications in Foods*. Marcel Dekker Inc, New York.

Rathore, N.S. and Mathur, A.N. (2001). Design and development of solar tunnel dryer for drying Di-basic calcium phosphate (DCP). *J. Agric. Res.,* **7** : 33-39.

Pande, U.B., Gowda, S.J. and Agrawal, Y.C. (1994). Problems in post-harvest handling of garlic and current status of reseach work done by AADF in the field of post-harvest technology. Associated Agricultural Development Foundation. Nasik. Newsletter No. 3 and 4, vol. 9.

Pruthi, J.S. (1988). Spices and condiments (chemistry, microbiology, technology). *Adv. in Food Res.* (Supp. IV) : 1-15

Sharma, P.K. (1993). Dehydration characteristics of ten garlic cultivars. *J. Food Sci. Technol.,* **28** : 348-351.

Singh, H., Bawa, A.S. and Ahmed, J. (1997). Dehydration characteristics of some green leafy vegetables. *Indian Food Packer,* **51** (2) : 5-16.

Singh, U. and Jambunathan, R. (1981). Studies on desi and kabuli chickpea (*Cicer arietinum*) cultivars. Level of protease inhibitors, levels of polyphenolic compounds and *in vitro* protein digestibility. *J. Food Sci.,* **46** : 1364-1367.

Srinivasan, K. (2000). Spices : Valued for more than taste and flavour of foods. In : *Recent trends in spices and medicinal plants research.* De A.K. (ed.), Associated Publ. Co., New Delhi, pp. 31-38.

Srinivasan, K. (2005). Role of spices and herbs beyond food flavouring : Nutraceuticals with multiple health effects. *Food Rev. Internat.,* **21** : 167-188.

Srinivasan, K., Sambaiah, K. and Chandrashekar, N. (2004). Spices as beneficial hypocholesterolemic food adjuncts : A review. *Food Rev. Internat*., **20** : 187-220.

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