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Effect of Packaging Conditions on Sensory Parameters of Bengal Gram, Gram Dhal and Gram Flour during Storage

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A B S T R A C T

The study of sensory parameters for stored samples of Bengal gram, gram dhal and gram flour in different were observed at every interval of 30 days. Samples were kept in laminated LDPE bags under different packaging conditions i.e. vacuum packaging, modified atmosphere packaging and ambient conditions for 120 days. The effect of packaging on the sensory parameters of stored samples *viz.*, colour, appearance, flavor, texture, taste and overall acceptability were found by 9 point Hedonic Scale. The results revealed that the study that mean score values of all sensory parameters were increased with storage period under vacuum in comparison to modified atmosphere and ambient conditions. The mean score values were lower in ambient condition. Therefore the sensory parameters for different stored samples under vacuum condition showed the significant result followed by modified atmosphere and ambient conditions.

Introduction

Pulses are an important source of protein for the poor as well as for the vegetarians. The split grains of pulses called *dhal.* Bengal gram is an important Rabi season's crop of Asia and Africa, also known as Chickpea (*Cicer aritinum L.*) belongs to family Leguminoseae and sub family Papilionaceae (Singh U. 1995). It is consumed in the form of whole as well as split/dhal and gram flour. They are the rich source of nutritional components *viz.*, protein, low fat, high carbohydrates, fiber, low sulfur containing amino acids, micronutrients, vitamins as well as antioxidants (Ofuya and Akhidue, 2005). The nutrition value of bengal gram in per 100g are; Carbohydrates (61g), Dietary fibre (17g), Sugars (11g), Protein (19g), Fat (6g), Saturated fatty acids (1g), Cholesterol (0mg), Vitamin C (4mg), Calcium (105mg), Iron (6.2mg) and Energy (346kcal), (http://www.usda.gov).

Physiological changes in Bengal gram increase during storage due to rich in protein, which affect on its physicochemical properties like colour, flavour and composition. Naik *et al.*, (2017) found that significant change in quality as well as sensory losses occur due to external living organisms such as insects, rodents and microorganisms, discoloration, bad odour, heat damage, etc. under natural

conditions. Jayas D.S. *et al.,* (2002) also studied on the grain storage. Therefore the storability as well as quality of grains should be preserved by high-quality scientific storage methods (http://www.commodityindia.com/ publication/pulses/article16.html).

There are several scientific methods of storage or preserving grain such as hermetic storage, vacuum and modified atmosphere storage, mix storage, fumigation for in-situ treatment of stored materials to enhance the storability, prevent from deterioration, protect the quality of grain and help to stabilize the economy.

In Vacuum storage, high insect mortality is achieved significantly by drawing out the air from the pack prior to the final sealing of the product to be packed under low atmospheric or negative pressure (Navarro 2006). It also preserves flavour and protects against dehydration and weight loss (Anonymous, 2006). Modified atmosphere storage has created by using the alteration of the natural storage gases such as carbon dioxide, oxygen and nitrogen to create the lethal atmosphere to pests and disinfestations of stored seeds without adding toxic gases such as phosphine or methyl bromide (Vasudevan *et al.,* 2014). Sanjeev *et al.,* (2006) and Meena *et al.,* (2017) noted that vacuum packaging and gas flushing techniques are used for the purpose to enhance the shelf life and prevention of food spoilage by oxidation.

Sensory evaluation techniques also used by several researchers to assess the effects of different storage conditions on the quality of grain samples. It is a scientific disciplines that analyses and measures human response to the composition of food *viz.,* colour, appearance, flavor, texture, taste and overall acceptability by nine-point hedonic scale. It requires panel of human assessors by whom the products are tested and responses are recorded by Mishra Malvika *et al.,* (2015). The nine-point hedonic scale is widely used, in which the panel members rate their preference for food, from extremely dislike to extremely like (Amerine M.A. *et al.,* 1965 and Meilgaard *et al.,* 1999). Hence, the objectives of this study were to analyse the sensory parameters under vacuum and modified atmosphere storage of cooked samples.

Materials and Methods

Samples of Bengal gram, gram dhal and gram flour were procured from local market of Jabalpur, M.P., India. Each 1kg samples were taken in three replications for 30, 60, 90 and 120 days inside the laminated LDPE bags along with specific five insects under vacuum and modified atmosphere packaging through purging of nitrogen gas inside the store. Chandel *et al.,* (2015) studied that insects were found in Bengal gram named *Callosobruchus chinensis*, whereas insects in gram dhal named *Rhizopertha* (http://www.iipr.res.in/pdf/postbulletins2may13) and *Tribolium castenium* in gram flour. These samples were also compared from ambient condition.

Under vacuum packaging, vacuum was created by Powervac vacuum sealing machine inside the laminated LDPE bags whereas under modified atmosphere packaging, samples were kept in laminated LDPE bags in which nitrogen gas were injected by special valve and pipe system. After that all samples were stored for 120 days. Sensory parameters were evaluated at interval of 30 days. For sensory evaluation, the samples of Bengal gram and gram dhal were also boiled whereas gram flour was used in the form of *Pakoda* by frying. These samples were presented to panel member to rate their hedonic response on 9 point hedonic scale (Sawant *et al.,* 2013). Mean sensory scores were calculated for sensory quality attributes.

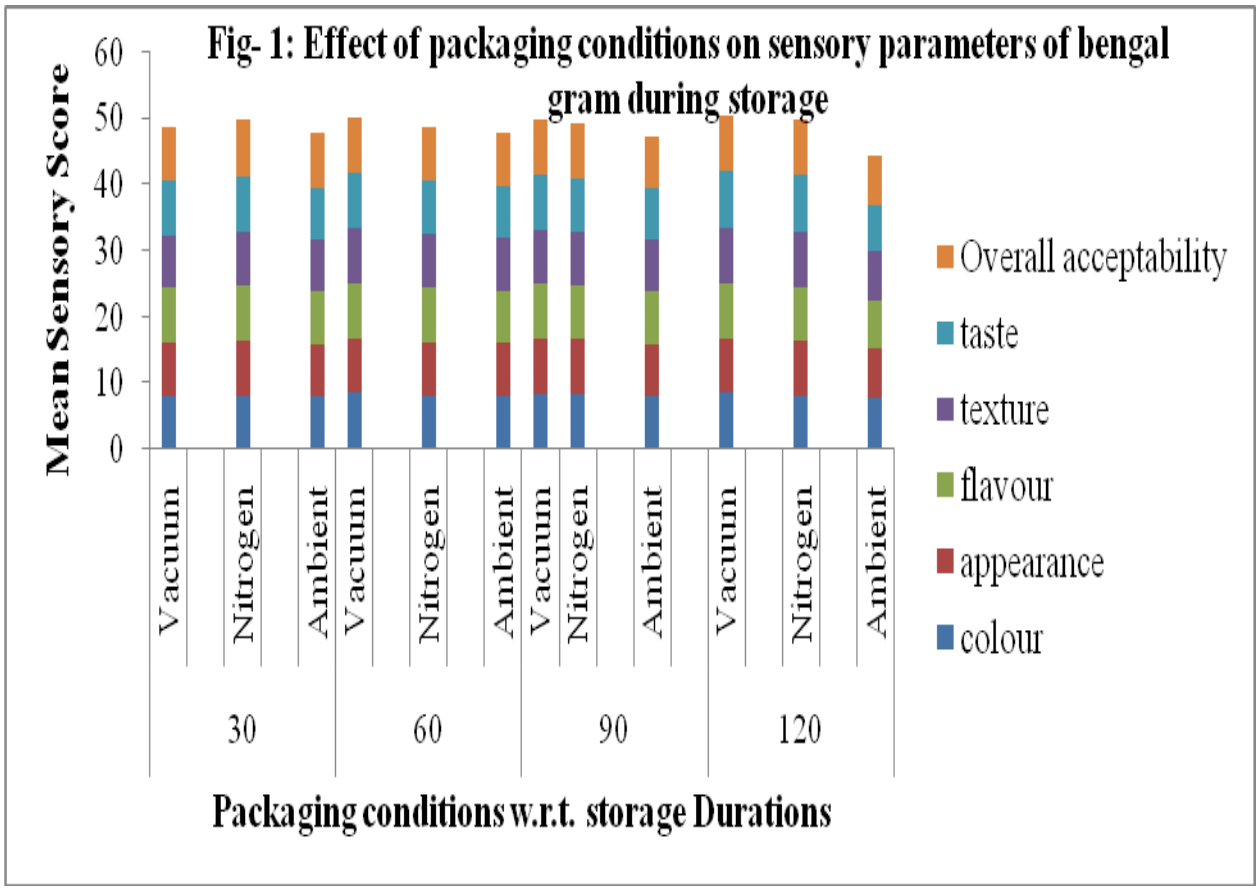
Results and Discussion

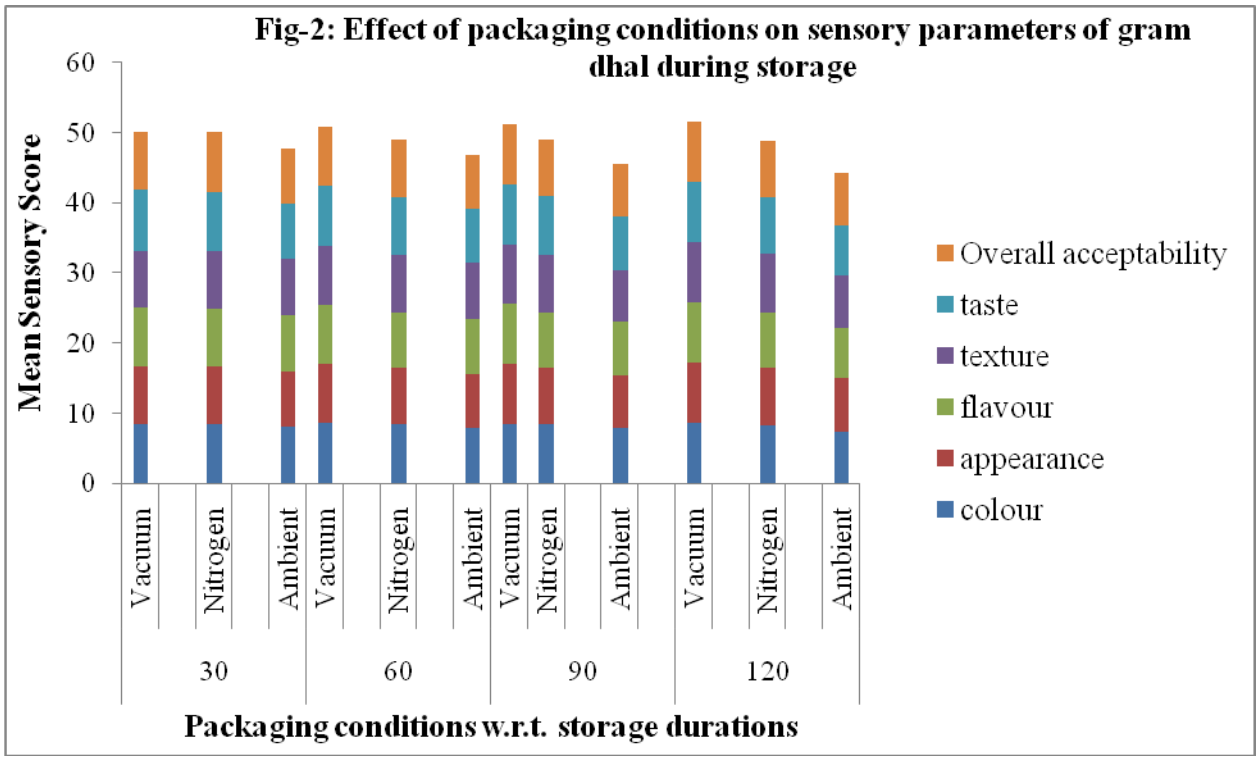
Effect of packaging conditions on sensory parameters of Bengal gram, gram dhal and gram flour were presented in (Fig. 1 to 3).

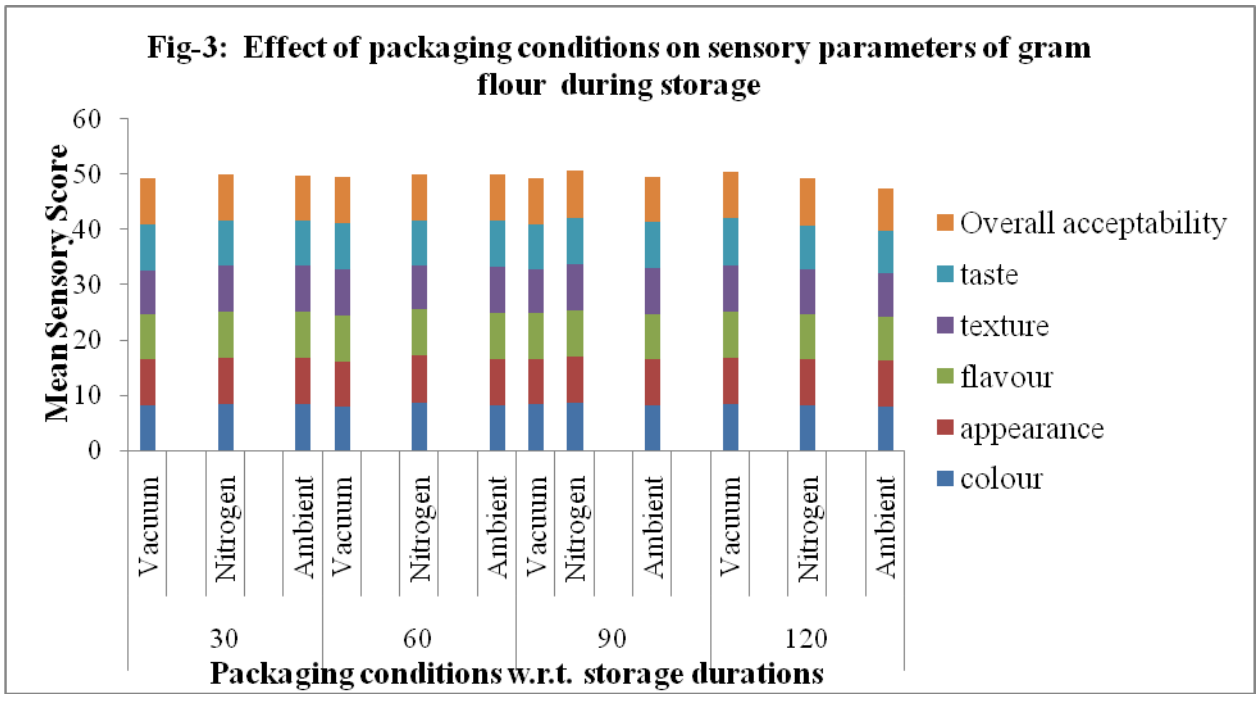
Increases in storage duration, all sensory parameters of samples were significantly changed under vacuum packaging, modified atmosphere packaging and packaging at ambient condition stored in laminated LDPE bags.

The mean score values of colour, appearance, flavor, texture, taste and overall acceptability for ten samples of Bengal gram were found at every interval of 30 days. For storage duration of 120 days, the range of mean score value of above sensory parameters were obtained as a 8.2-8.6, 8.0-8.2, 8.2-8.4, 8.0-8.2, 8.2-8.6 and 8.2-8.4 respectively under vacuum packaging whereas the ranges were 8.2-8.0, 8.2-8.4, 8.4-8.2, 8.2-8.4, 8.2-8.4 and 8.8-8.4 respectively under modified atmosphere packaging and 8.0-7.8, 7.8-7.6, 8.0-7.2, 7.8-7.4, 8.0-7.0 and 8.2-7.4 respectively for ambient condition (Fig. 1).

For the ten gram dhal samples, the mean score values of colour, appearance, flavor, texture, taste and overall acceptability were found at every interval of 30 days. For storage duration of 120 days, the range of mean score value of above sensory parameters were obtained as a 8.4-8.6, 8.2-8.6, 8.4-8.6, 8.2-8.6, 8.6-8.6and 8.4-8.6 respectively under vacuum packaging whereas the ranges were 8.4-8.2, 8.2-8.2, 8.2-8.0, 8.4-8.4, 8.4-8.0,and 8.6-8.0 respectively under modified atmosphere packaging and 8.0-7.4, 8.0-7.6, 8.0-7.2, 8.0-7.4, 7.8-7.2 and 8.0-7.4 respectively for ambient condition (Fig. 2).







The mean score values of colour, appearance, flavor, texture, taste and overall acceptability for ten samples of gram flour were found at every interval of 30 days. For storage duration of 120 days, the range of mean score value of above sensory parameters were obtained as a 8.2-8.4, 8.2-8.4, 8.2-8.4, 8.0-8.2, 8.4-8.6 and 8.2-8.4 respectively under vacuum packaging whereas the ranges were 8.4-8.2, 8.4-8.4, 8.2-8.0, 8.4-8.2, 8.2-8.0 and 8.4-8.4 respectively

under modified atmosphere packaging and 8.4-8.0, 8.4-8.2, 8.4-8.0, 8.4-8.0, 8.0-7.6 and 8.2-7.6 respectively for ambient condition (Fig. 3).

Therefore the mean score values of all sensory parameters were higher under vacuum packaging for all samples of Bengal gram, gram dhal and gram flour for 120 days whereas for modified atmosphere packaging, sensory parameters were significantly varied. Under ambient conditions, all the sensory parameters were decreased for all samples for 120 days. It may be due to respiration by grain as well as insects present under ambient conditions, which were responsible for the sensory quality deterioration. The similar observations were found by Naik D. Saida and Chetti (2017) for rice grain in different types of packaging materials and under vacuum.

The present study revealed that samples stored under vacuum packaging, modified atmosphere packaging and ambient conditions and showed that mean score values of all sensory parameters were increased with storage period under vacuum packaging in comparison to modified atmosphere packaging and packaging at ambient conditions. The mean score values were lower for the packaging under ambient condition. Therefore the sensory parameters for stored samples under vacuum condition showed the significant result followed by modified atmosphere packaging and packaging at ambient conditions.

References

Amerine, M. A., Pangborn, R. M. and Roessler, E. B., 1965. Principles of Sensory Evaluation of Food, Academic Press, New York. Pp. 23-45

Anonymous, 2006. What is vacuum packaging?

Chandel B.S. and Bhadauria D.S., 2015. Assessment of resistance to the attack of pulse beetle, *Callosobruchus chenensis* (Fabricius) in chickpea genotypes on the basis of various physical parameters during storage, Journal of Entomology and Zoology studies, 3(2): 160-165

http://www.commodityindia.com/publication/pulses/article16.html

http://www.iipr.res.in/pdf/postbulletins2may13

http://www.usda.gov

Jayas D.S. and Jeyamkondan S. 2002. Modified storage of grain, meat, fruits and vegetables. Review paper, Biosystem Engineering, Vol. 82(3), pp: 235-251.

Meena M.K., Chetti M.B., Nawalagatti C.M. and M. Chandra Naik, 2017. Vacuum Packaging Technology: a Novel Approach for extending the Storability and Quality of Agriculture Produce, *Advances in Plants and Agriculture Research,* Vol. 7 (1), pp: 1-6

Meilgaard M., G.V. Civille and B.T. Carr. 1999. Sensory Evaluation Techniques. Third Edition. CRC Press, Boca Raton.

Mishra Malvika and Singh Neetu, 2015, Sept. Sensory Evaluation of Developed Snack Products by Rice & Pulses for School Going Children, Journal of Science and Research (IJSR), Vol. 4(9), pp:646-648

Naik D. Saida and Chetti M.B., 2017. Effect of Storage Conditions and Packaging on Sensory Evaluation of Rice, *International journal of Current Microbiology and Applied Sciences*, Vol. 6 (10), pp. 1219-1230

Navarro S. 2006. Modified atmospheres for the control of stored-product insects and mites. In Heaps JW (Ed): Insect Management for Food Storage and Processing. Second Edition. 105-146. AACC International, St. Paul, MN

Ofuya, Z. M., and Akuidue, V., 2005. The Role of Pulses in Human Nutrition: A

Review. *Journal of Applied Science and Environmental management*, Vol. 9(3), pp: 99-104.

Sanjeev K, Ramesh M.N., 2006. Low oxygen and inert gas processing of foods, *Journal of Critical Reviews in Food Science and Nutrition*, Vol. 46(5), pp: 423-451

Sawant A.A., N.J. Thakor, S.B. Swami and A.D. Divate, 2013, Physical and Sensory Characteristics of Ready-To-Eat Food Prepared from Finger Millet based composite Mixer by Extrusion, *Agricultural Engineering International:* CIGR Journal, Vol. 15(1), pp: 100-105

Singh, U., 1995, Methods of dehulling of pulses: A critical appraisal, *Journal of Food Science and Technology*, Vol. 32, pp: 81-93

Vasudevan S.N., Shakuntala N.M., Teli Shreshail, Goud Shanker, Gowda Basave and Ravi, 2014. Studies on Effect of Modified Atmospheric Storage Condition on Storability of Groundnut (*Arachis hypogaea* L.) Seed Kernels. *International Journal of Research Studies in Biosciences*, Vol. 2(2), pp: 25-36

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