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Effect of storage period and containers on the fat and crude protein content of different barley (*Hordeum vulgare*) varieties

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Barley(*Hordeum vulgare*) is a widely grown cereal crop, especially in temperate regions. It is one of the first cereal crops to be domesticated and cultivated around the world. It is a nutritious crop and is a rich source of essential nutrients including proteins, dietary fibres, vitamins and dietary minerals. Raw barley contains 78% carbohydrates, 2% fat, 10% protein, and 10% water [Source: *USDA*]. Although it is a crop most suited to colder, temperate climates and widely adaptable to many regions, it is not exactly a winter-hardy crop. Also, temperatures above 25ºC can shorten the shelf life of barley seeds. Therefore, proper storage of barley seeds is necessary to maintain their shelf life.

Nutritional losses in seeds occur when seeds are not stored in proper conditions. Lipid peroxidation and protein breakdown are some of the major physiological changes that occur in seeds due to improper storage conditions. The present study was carried out to determine the effect of the storage period on the fat content and crude protein content of different varieties of barley when stored in different types of containers under ambient conditions. Six different varieties of barley were selected for the study viz. K-409, K-551, K-560, K-603, K-1055, and K-1149. The seeds of each variety were stored in two different types of bags, i.e., cotton bags and polythene bags. Tests for fat content and crude protein content were conducted for a period of ten months during which the seeds were kept in storage under ambient conditions. This is to determine the amount of nutritional loss that occurs during seed storage.

Firstly, the fat content of the barley seeds was obtained by the petroleum ether solvent extraction method. 1g of ground barley seeds was weighed on a filter paper for every replication and wrapped in the same filter paper. The filter paper pouches were then stacked in a large beaker and filled with petroleum ether so that all of the samples are immersed. The

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liquid was then decanted after half an hour. The same procedure was repeated two more times with fresh petroleum ether after which the samples were dried and weighed. The total fat percentage was determined by the formula:

$$\frac{\text{(wt. of the sample before extraction - wt. of the sample after extraction)} \times 100}{\text{wt. of the sample before extraction}}$$

Now, the calculation of crude protein content is done by the Kjeldahl method of protein determination. Here again, 1g of ground barley seeds was weighed on a filter paper for every replication and wrapped in the same filter paper. In this method, after digestion of the organic matter in concentrated sulphuric acid, the total nitrogen is converted to ammonium sulphate. The ammonia then formed is distilled into boric acid in alkaline conditions. The borate anions formed are then titrated against standardised hydrochloric acid. This determines the amount of nitrogen present in the sample which is a representation of the crude protein content in the sample. Most proteins contain 16% of nitrogen. The conversion factor from nitrogen percentage to crude protein percentage is 6.25. Thus, crude protein percentage = N% x 6.25.

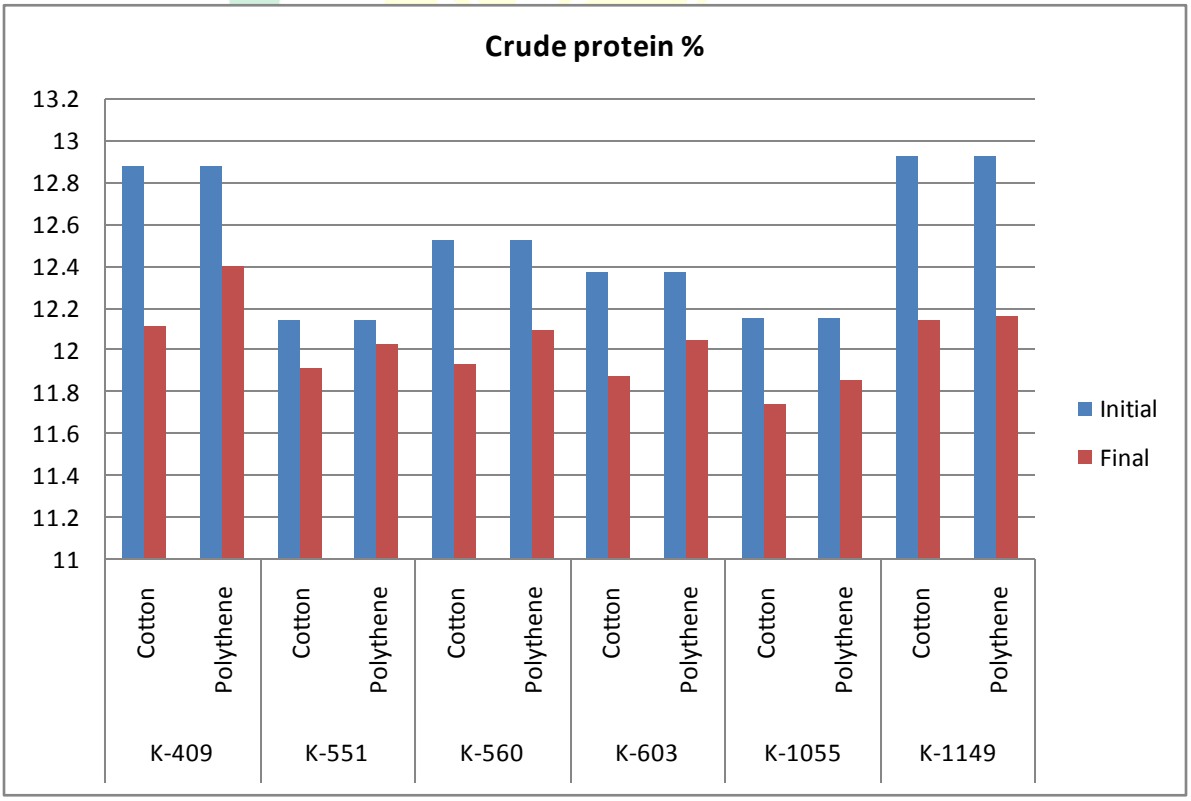

Figure 1 Crude protein percentage of different varieties of barley

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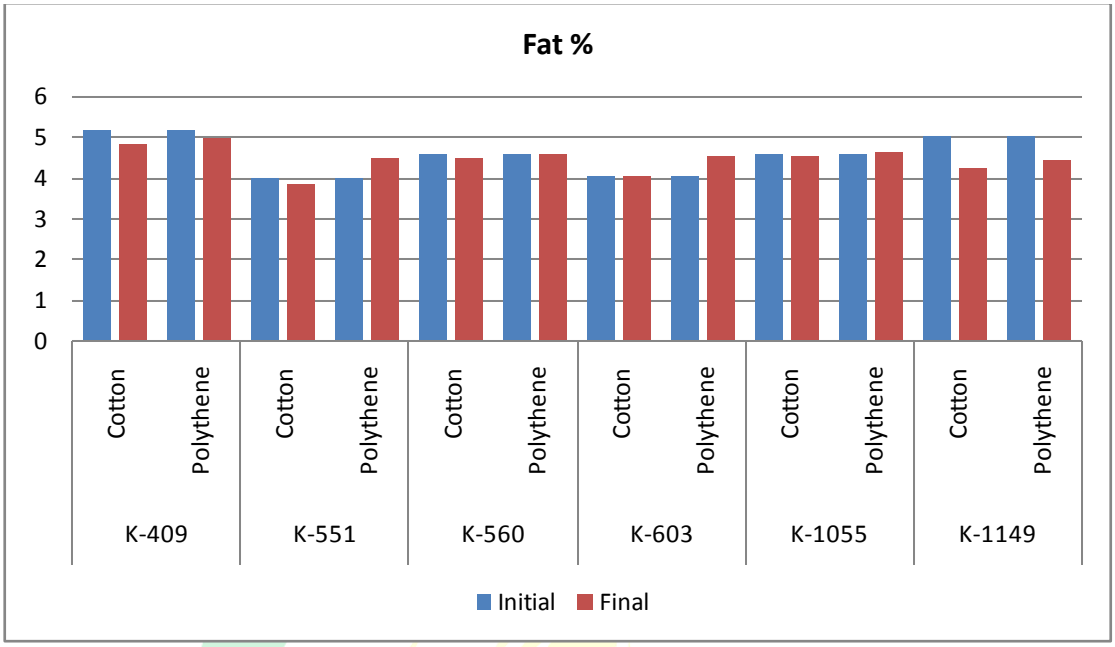

Figure 2 Fat percentage of different varieties of barley

The result of this study indicated that there was a significant decrease in the crude protein content of the seeds. The crude protein content of the barley seeds had decreased by 3.68% from the start of the storage period till the end. However, even though a decrease in fat content was observed, it was not very significant. K-409 was found to be the best performing variety during the storage period concerning both crude protein and fat content. It was also found that the seeds stored in polythene bags showed better results than the seeds stored in cotton bags. This shows that non-permeable storage containers (i.e., polythene bags) are better at maintaining the nutritional quality and, therefore, the shelf life of the seeds. Conditioning barley will also preserve the quality of the grain, allowing it to be stored safely for longer periods. Grain conditioning processes include aeration, unheated or natural grain drying, dry aeration, in-storage cooling and heated air grain drying. This study showed the importance of appropriate storage containers for better long termstorage of barley seeds.