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# Effect of drying temperature and packaging materials on quality of pumpkin powder during storage

**Laxmi Kant Rawat, Atul Anand Mishra, RN Shukla and Rakhi**

**Abstract**
The study was conducted to evaluate the effect of 70 $^0$C Pumpkin and 80 $^0$C samples on shelf - life of pumpkin powder and to evaluate the effect of temperature treatments, chemical composition such as moisture content, fat content and protein content were carried out. Sensory analysis of color, texture, aroma and overall acceptability were carried out according to 9 point hedonic scale. To evaluate the shelf-life of pumpkin powder packed in HDPE and PP packaging materials, TPC and yeast & mold counts were carried out. The results showed that 70 $^0$C sample was more suitable according to fat and protein content. For moisture content 80 $^0$C sample was more favorable. PP excelled than HDPE as a packaging material to store pumpkin powder for a long period of time. According to sensory score, 80 $^0$C sample was more favored by the panelist than 70 $^0$C sample. With increase in storage period TPC and yeast & mold increased but 80 $^0$C sample showed less growth of TPC and yeast & mold when compared to 70 $^0$C sample. PP showed less microbial count than the HDPE, so it is most suitable for Pumpkin powder packaging for a long period of time.

**Keywords:** PP, HDPE, tray dryer, sensory and temperature

## 1. Introduction
A pumpkin is a widely cultivar of winter squeeze. It is round with fleshy, slightly ribbed skin, and is most often dark yellow to orange in color. The thick shell made of contains the seeds and pulp. The mostly commonly used for vascular plant of *Cucurbita pepo*, but some vascular plant of *Cucurbita maxima*, *C. argyrosperma*, and *C. moschata* have related appearance also sometimes called "pumpkin. Native to North America (northeastern Mexico and the southern United States), pumpkin fruits are one of the oldest domesticated plants, having been used as early as 7,500 to 5,000 BC.

The pumpkin is a squash fruit most commonly orange in color when ripe, that has been used traditionally both as human and as animal feed. In dietary terms, it is commonly regarded as a vegetable. It is much admire when cooked or pureed, and has numerous culinary uses either as a vegetable or such as an ingredient in pies, soups, stews, breads, and many other dishes. Pumpkin is a seasonal crop, and since fresh pumpkins are much sensitive to microbial spoilage, even at refrigerated conditions, they should be dried or frozen. We should be knowledge about of the nutritive value of food, particularly fruits and vegetables, is obligatory in order to encourage the increase in their consumption, and their use for nutritional and technological applications. Pumpkin is a source of carotene, water-soluble vitamins and amino acids. It is relatively low in total solids, usually ranging between 7% and 10%. Pumpkin fruits are also present good chemical composition, rich in antioxidants and vitamins allows the pumpkin to have an important health-protecting effect. In fact, the range of values of lipophilic substances as carotenoids present in pumpkin varieties can contribute significantly to the uptake of pro-vitamin A and especially lutein, a carotenoid with special physiological functions.

Drying is the oldest methods of food preservation. Drying can be carried out by many methods here including tray dryer at different temperature 70 $^0$C & 80 $^0$C. Tray dryer has low operation cost and easy process control however it induces many non-reversible quality losses in the material such as color, nutritional value, shrinkage, texture, dense structure etc. Dried foods certain shapes or in form small slices essential a rehydration stage before consumption or next processing and in most of the cases rehydration may lead to further undesirable quality. So, the rehydration capacity and the rate of rehydration which indicate the quality of instant foods and dried foods, ready-to-eat meals must be evaluated.

## 2. Materials and Method

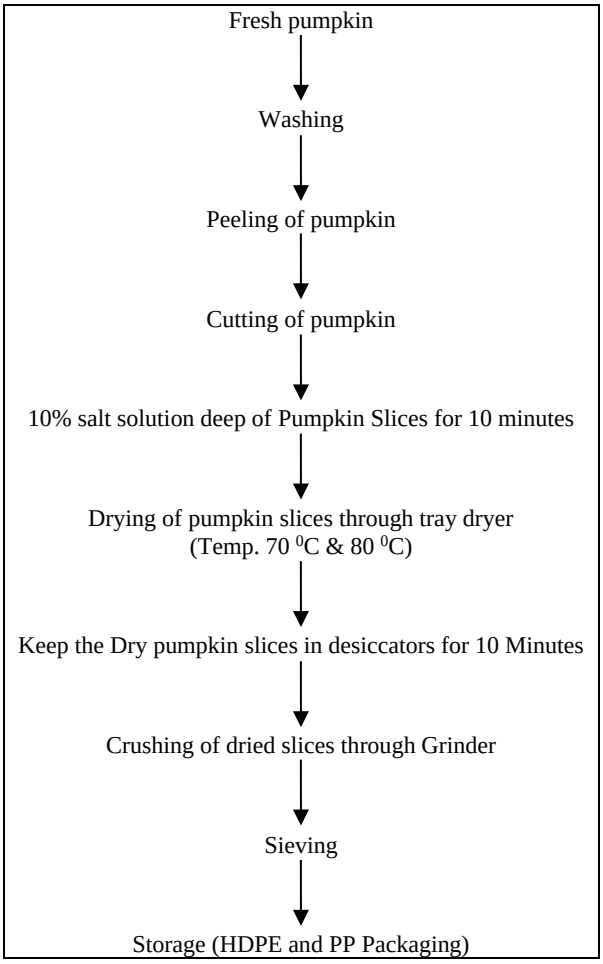
### 2.1 Procurement of raw material

Fresh Pumpkin was procured from local market.

### 2.2 Preparation of sample

Fresh Pumpkin was selected and washed thoroughly under running water to remove soil and chemical residues. After washing, Cutting slices were spread over the tray to remove excess water, pieces were kept uniform in size and they were dried at the same rate. Samples were divided in 2 parts 70 $^0$C and 80 $^0$C.

### 2.3 Preparation of Pumpkin powder




### 2.4 Physico-Chemical analysis

The moisture content, Protein and fat of the Pumpkin powder were determined according to the standards of AOAC (2010) and Ranganna (1986).

### 2.5 Sensory evaluation

Pumpkin powder was evaluated by a panel of ten untrained judges for the sensory attributes of color, texture, aroma and overall acceptability using a nine point structured hedonic scale. It scores was 9 = extremely liked, 8 = very much liked, 7 = Moderately liked, 6 = Slightly liked, 5 = neither liked nor disliked, 4 = Slightly disliked, 3 = Moderately disliked, 2 = Very much disliked and 1 = Extremely disliked.

### 2.6 Microbial Analysis

The microbial characteristics of were also determined for storage period of pumpkin powder.

### 2.7 Statistical analysis

Data were analyzed using analysis of variance. The mean scores were analyzed using analysis of variance (ANOVA) method and difference separated using F- test. Significance was accepted at $p \leq 0.05$.

## 3. Result and Discussion

The Experiments were conducted to study the effect of drying temperature at 70 $^0$C & 80 $^0$C and packaging materials on quality of Pumpkin Powder during storage. Dried Pumpkin samples were ground to powder in a domestic grinder. Pumpkin Powder samples were packed in HDPE and PP bags and stored at room temperature for 60 days.

### 3.1 Preparation of Pumpkin powder

Pumpkin powder was prepared and packed in two different packaging materials (HDPE and PP) and stored for 60 days. During storage period different analyses were done.

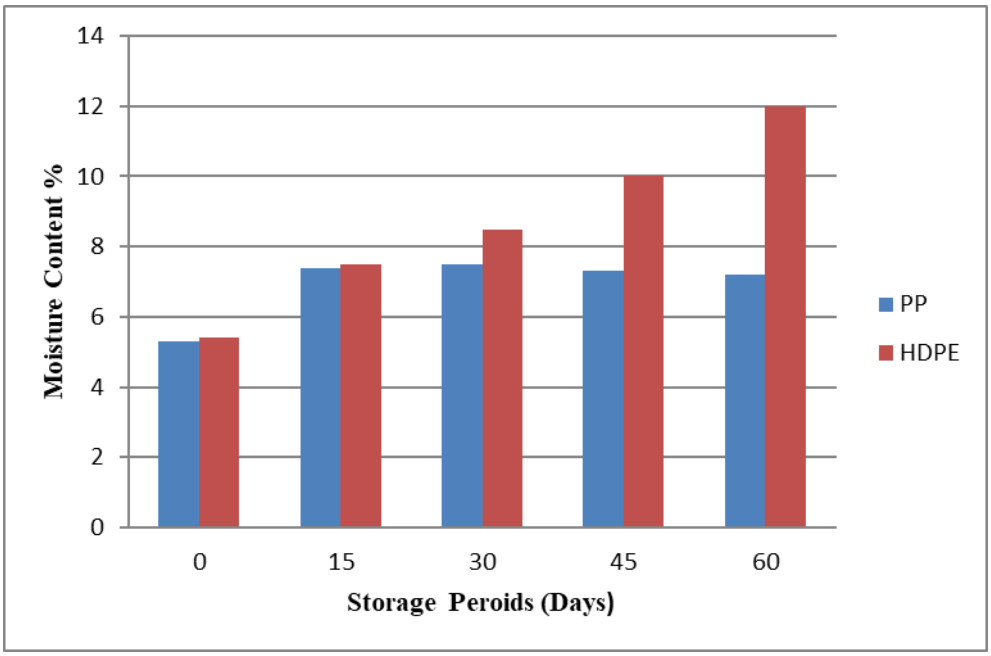



**Fig 1:** Effect of packaging materials on moisture content of pumpkin powder dried at 70 $^{0}$C

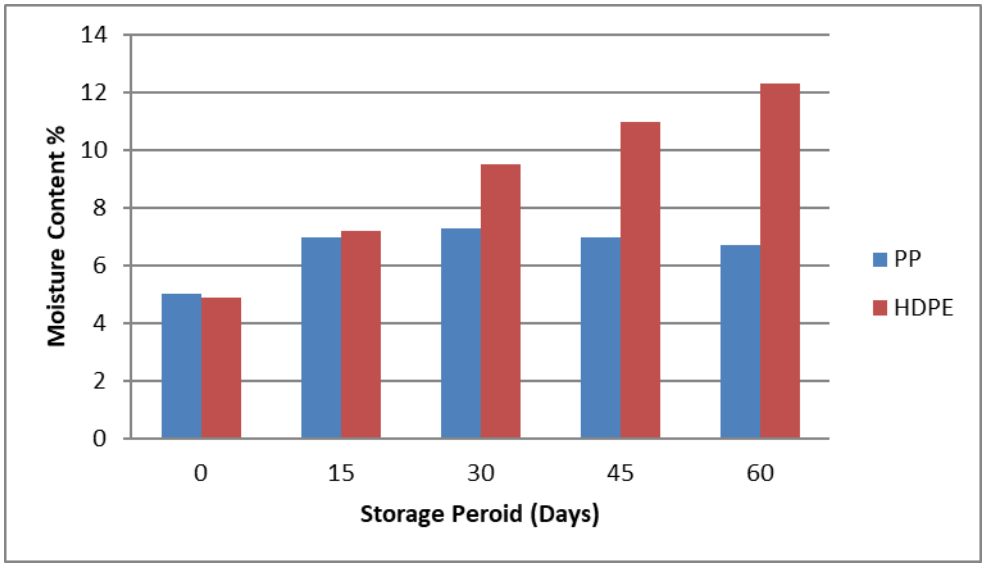



**Fig 2:** Effect of packaging materials on moisture content of pumpkin powder dried at 80 $^{0}$C

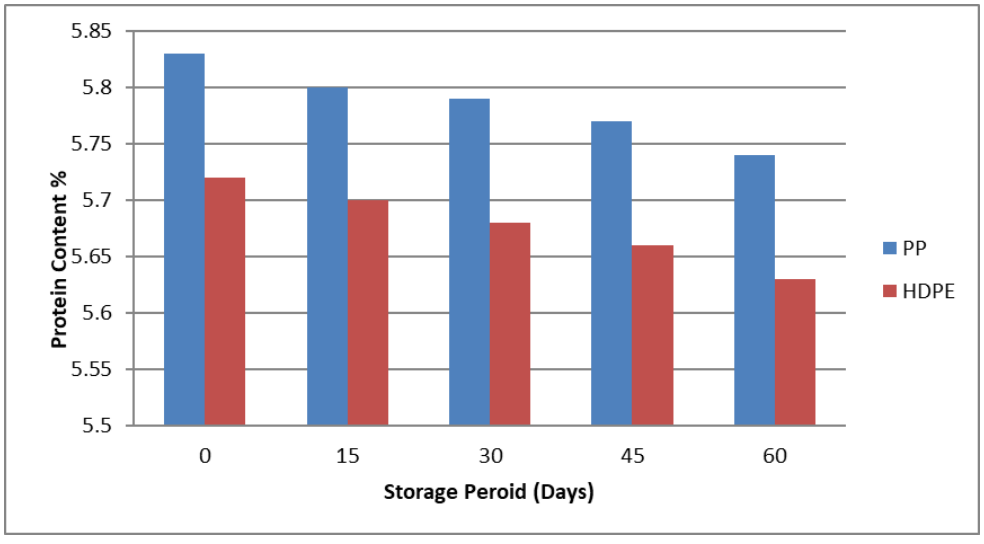



**Fig 3:** Effect of packaging materials on protein content of pumpkin powder dried at 70 $^{0}$C

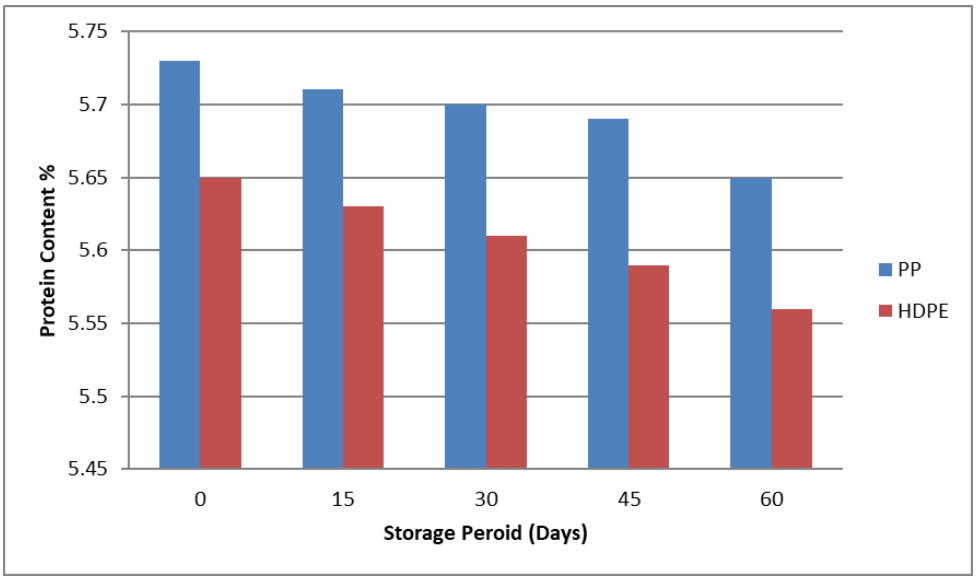



**Fig 4:** Effect of packaging materials on protein content drying of pumpkin powder dried at 80 $^{0}$C

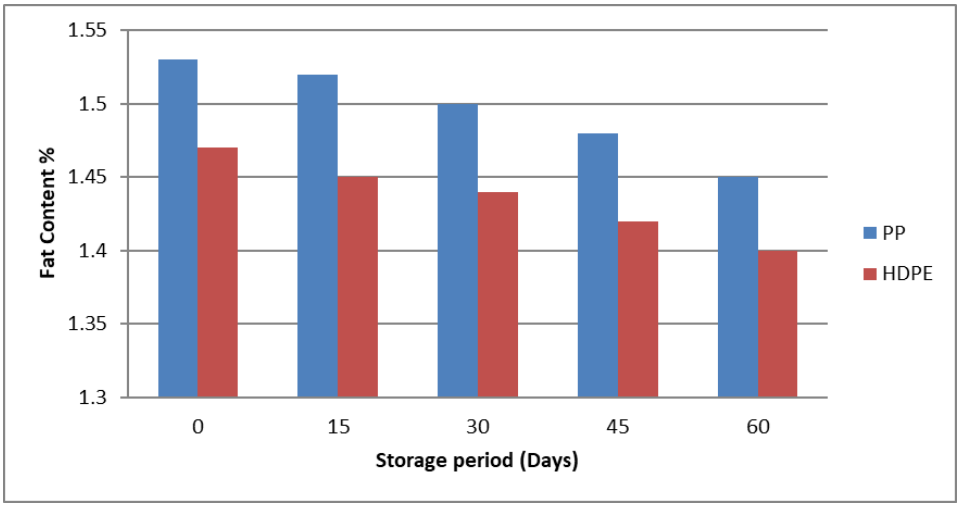



**Fig 5:** Effect of packaging materials on fat content of pumpkin powder dried at 70 $^{0}$C

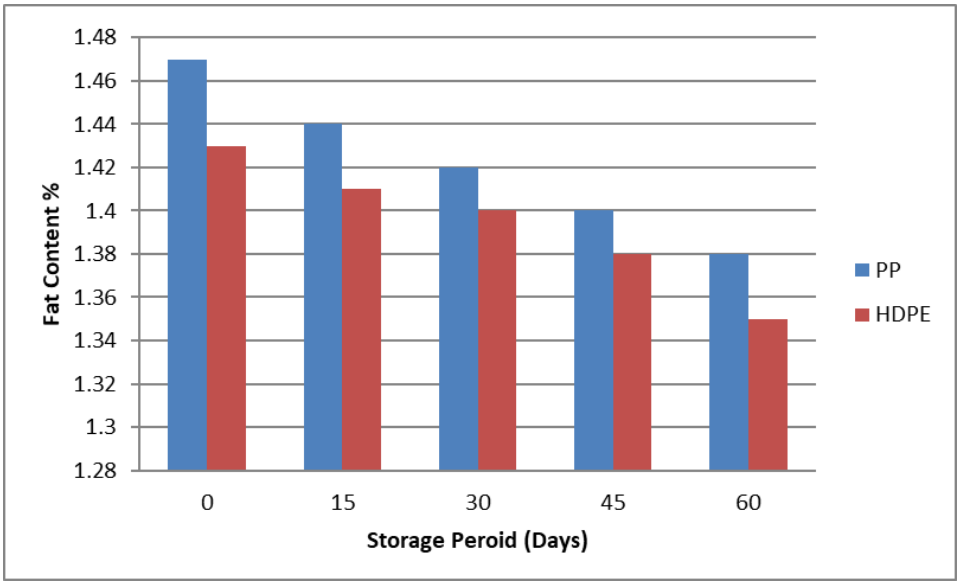



**Fig 6:** Effect of packaging materials on fat content drying of pumpkin powder dried at 80 $^{0}$C

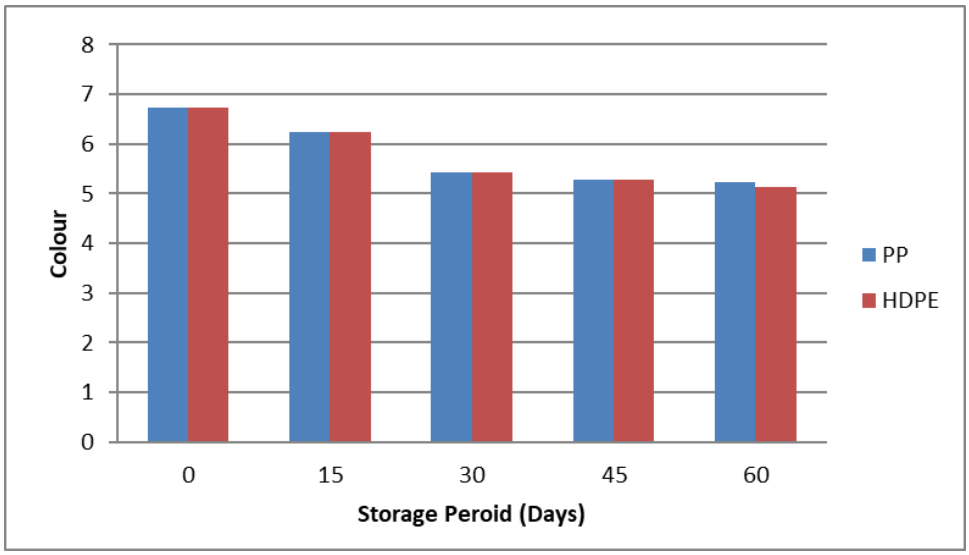



**Fig 7:** Effect of packaging materials on color of Pumpkin powder dried at 70 $^{0}$C

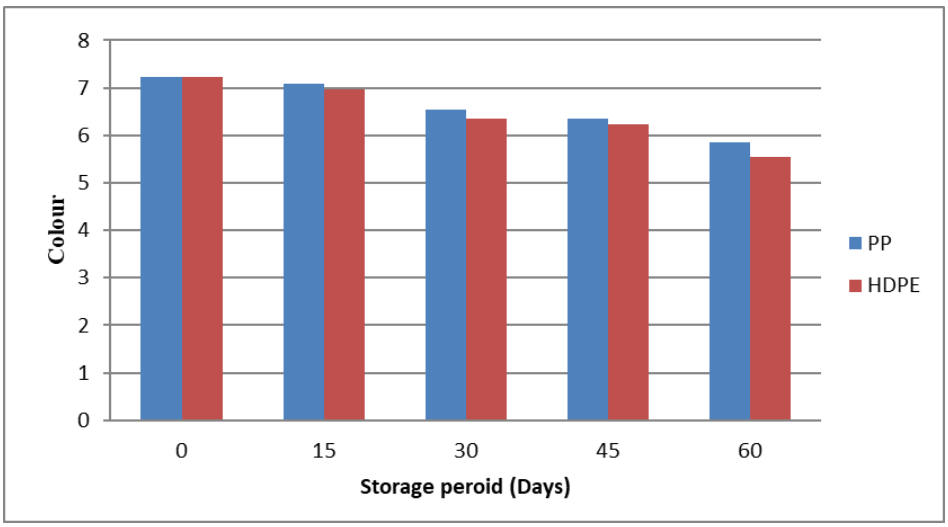



**Fig 8:** Effect of packaging materials on color of pumpkin powder dried at 80 $^{0}$C

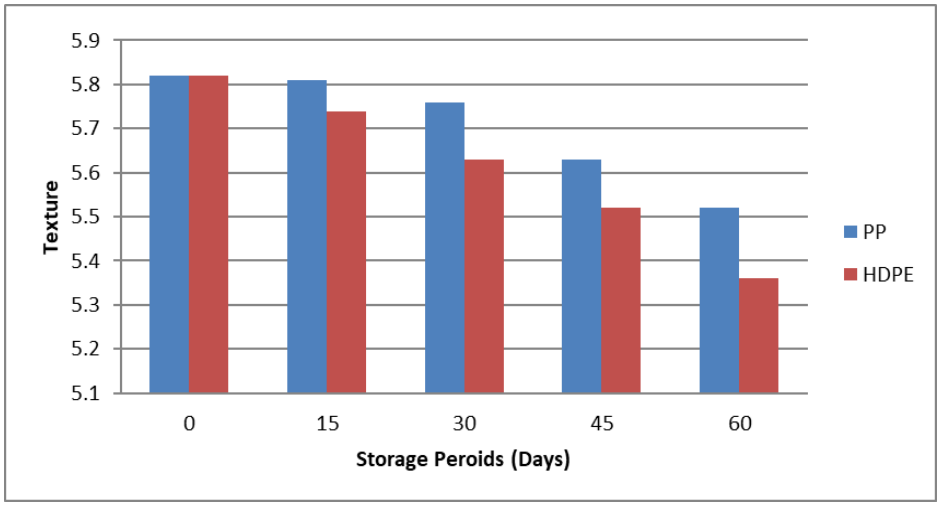



**Fig 9:** Effect of packaging materials on texture of pumpkin powder dried at 70 $^{0}$C

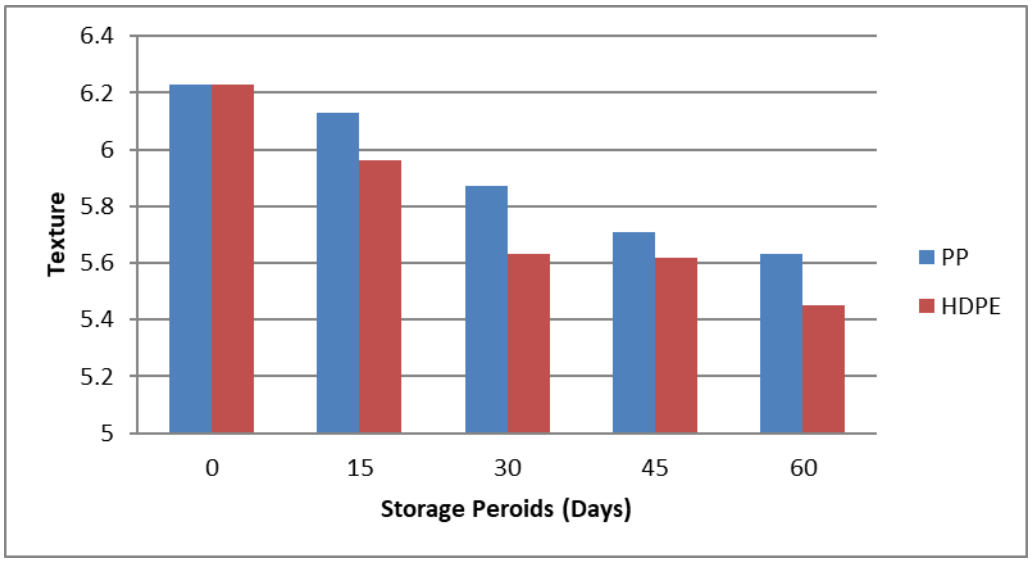



**Fig 10:** Effect of packaging materials on texture of pumpkin powder dried at 80 $^{0}$C

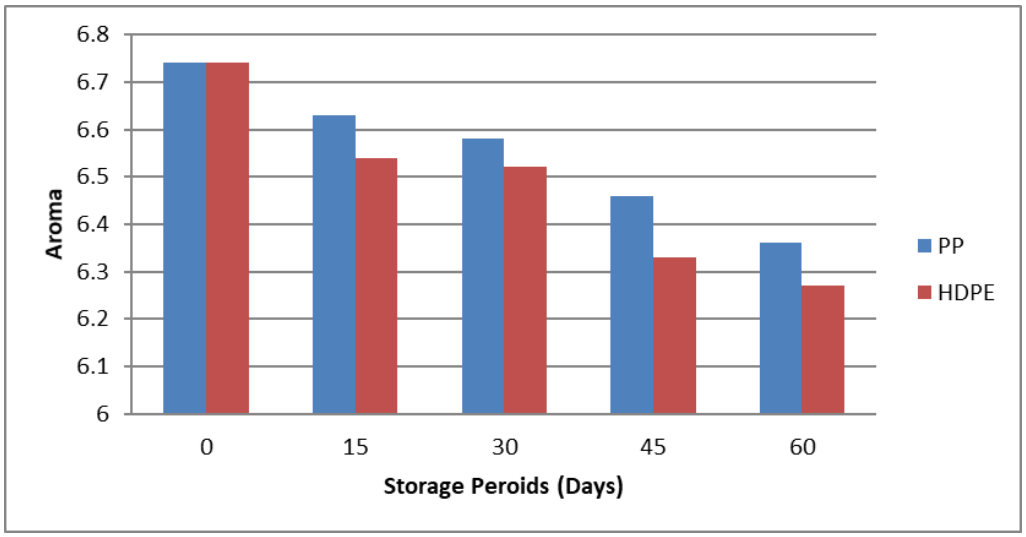



**Fig 11:** Effect of packaging materials on aroma of pumpkin powder dried at 70 $^{0}$C

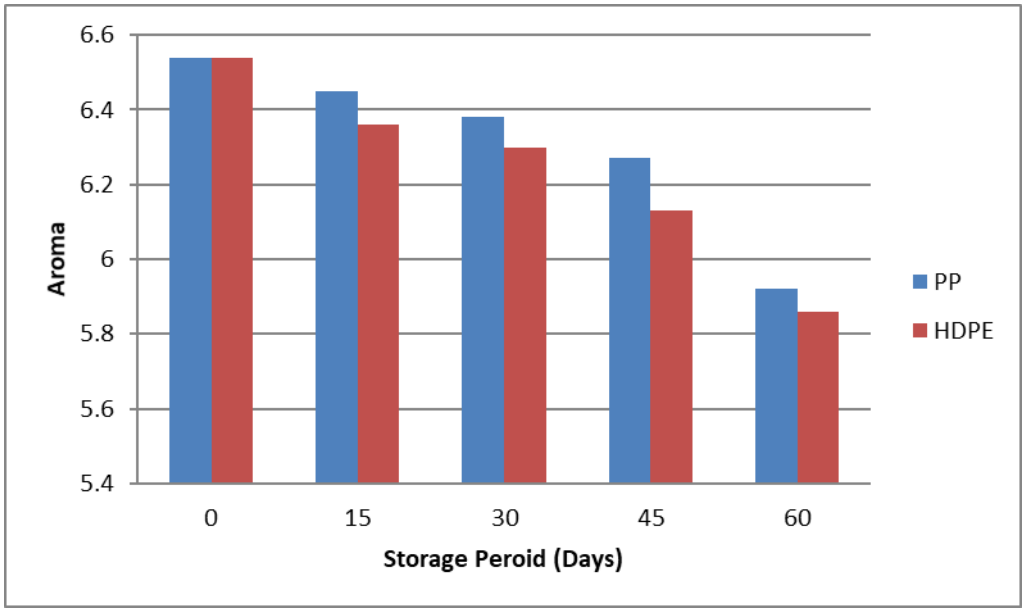



**Fig 12:** Effect of packaging materials on aroma of pumpkin powder dried at 80 $^{0}$C

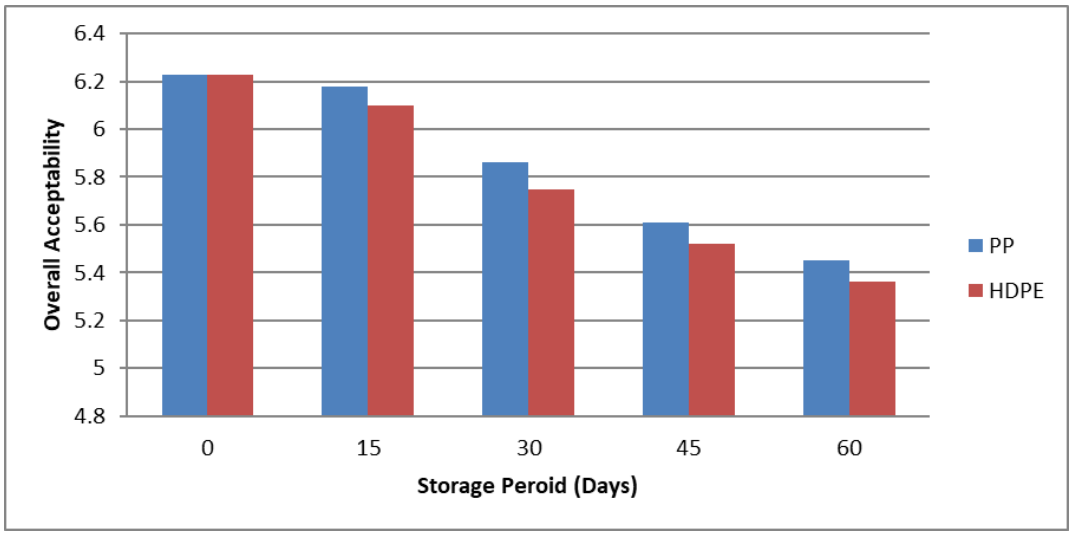



**Fig 13:** Effect of packaging materials on overall acceptability of pumpkin powder dried at 70 $^{0}$C

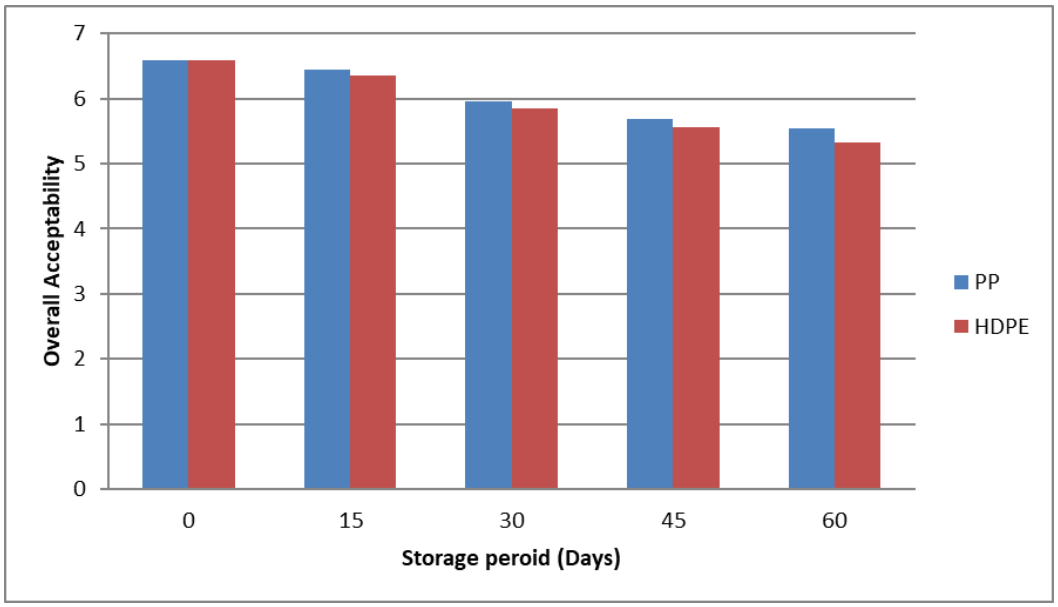



**Fig 14:** Effect of packaging materials on overall acceptability of pumpkin powder dried at 80 $^{0}$C

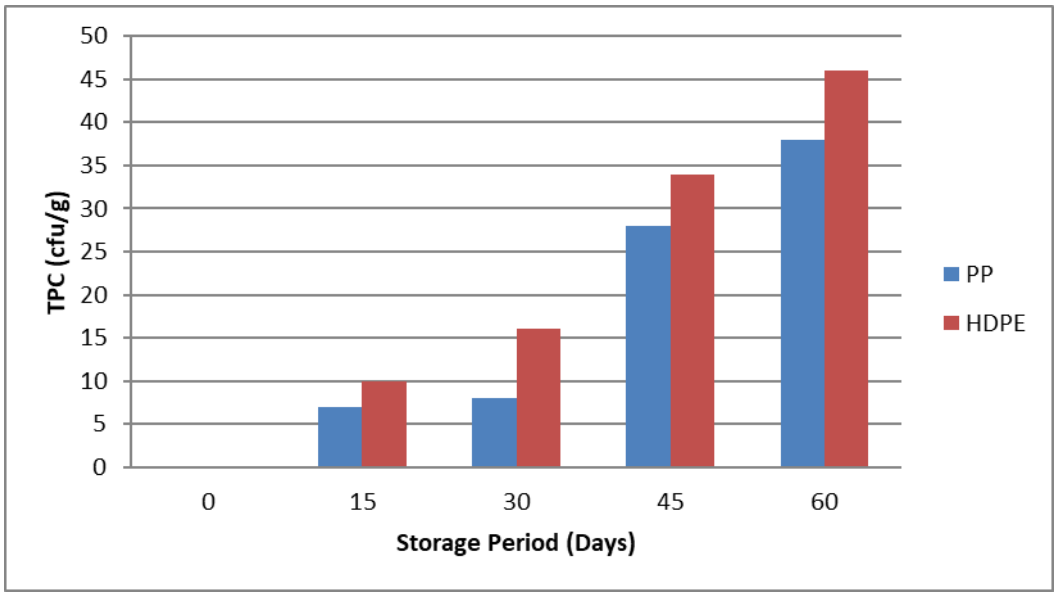



**Fig 15:** Effect of packaging materials on total plate count (TPC) of pumpkin powder dried at 70 $^{0}$C

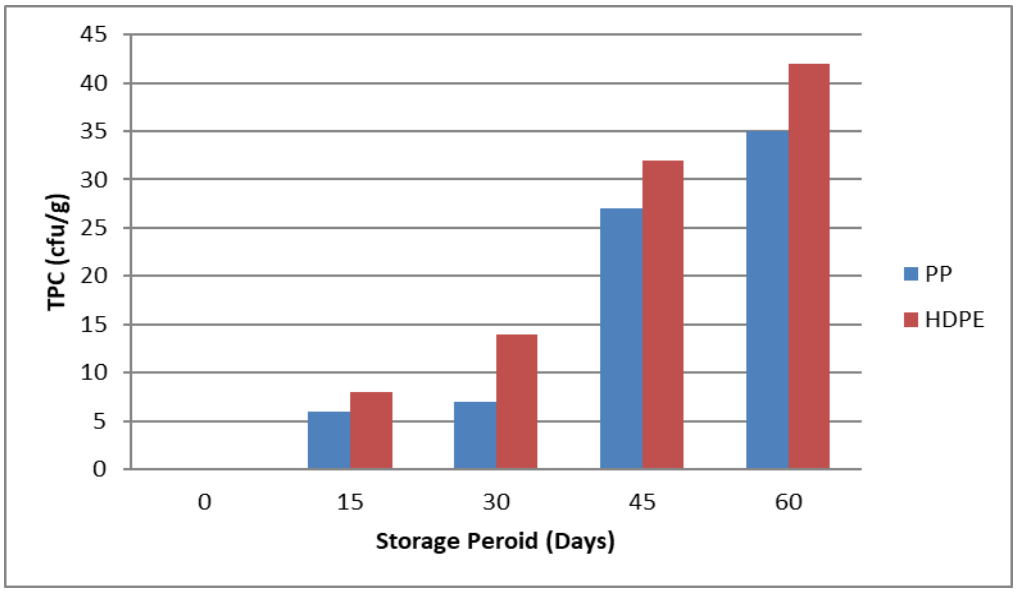



**Fig 16:** Effect of packaging materials on total plate count (TPC) of pumpkin powder dried at 80 $^{0}$C

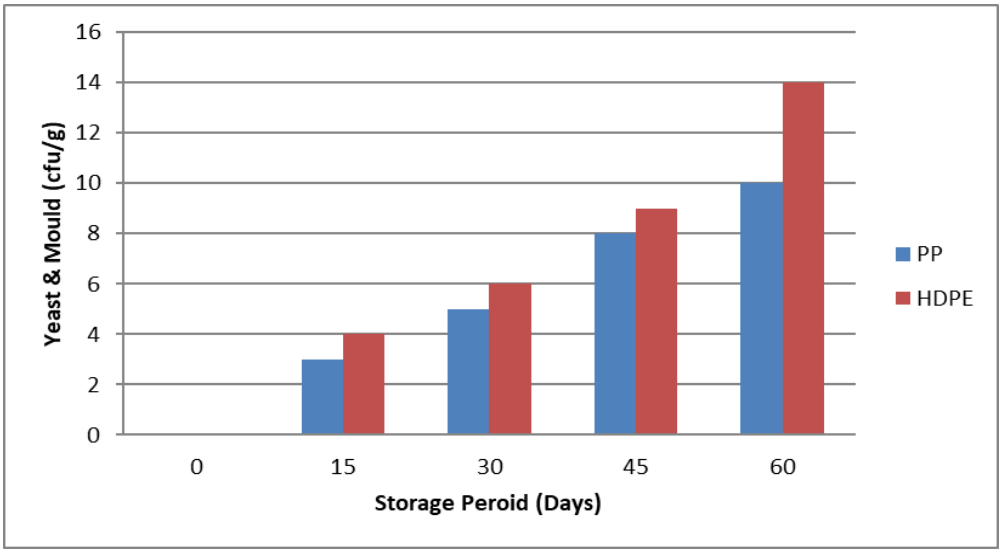



**Fig 17:** Effect of packaging materials on yeast & mould of pumpkin powder dried at 70 $^{0}$C

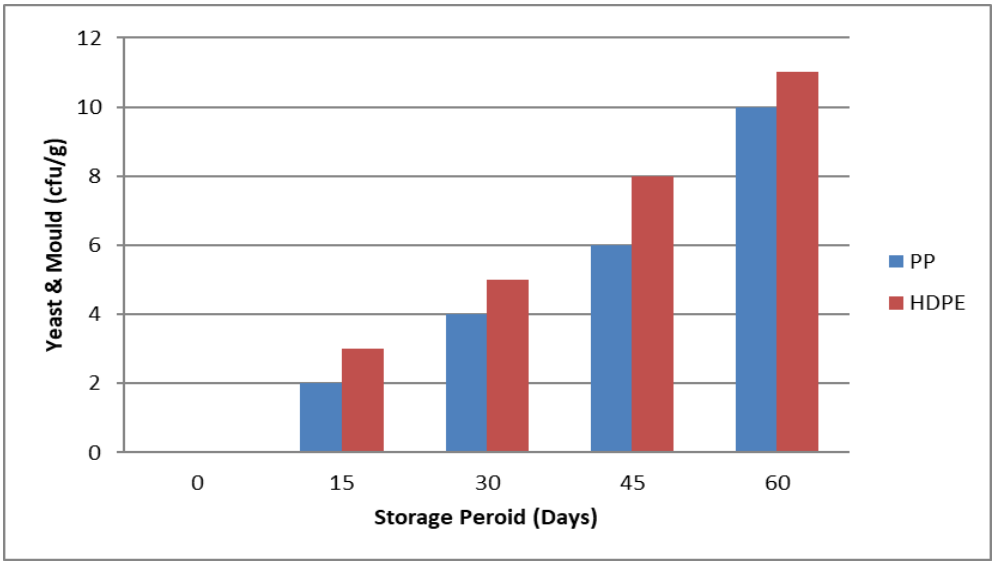



**Fig 18:** Effect of packaging materials on yeast & mould count of pumpkin powder dried at 80 $^{0}$C

## 4. Conclusions

From the study it was concluded that the moisture content of the pumpkin powder was affected by drying temperature and packaging materials. The fat content and Protein content decreased with increase in storage period for both the samples. Protein content was not much influenced by any of the treatment Microbial count increased with increase in time (days). The 70 $^{0}$C samples packed in PP were the most accepted sample of pumpkin powder with response to sensory score.

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