STUDIES REGARDING THE EFFECT OF STORING RICE AT LOW TEMPERATURES UPON THE SENSORY QUALITIES OF COOKED RICE

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Abstract
Cultivated rice at present sustains two-thirds of the world's population. A small amount of the rice crop is used as ingredients in processed foods and as feed, but the bulk is consumed as cooked rice. Cooked rice from freshly harvested rice is generally stickier than that from aged rice and is not preferred by people.
During storage, a number of physico-chemical and physiological changes occur, this is usually termed ageing . Although the mechanism of rice ageing is not fully understood, the changes of pasting properties, colour, flavour, and composition of rice can be observed , which affects milling, cooking and eating quality . The sensory qualities of cereal destined for human consumption have an influence on their economical value on the world market. These sensory qualities are influenced by: the type of cereal, climatic conditions, conditions during harvesting and the operations after harvesting (drying, storage and grinding conditions). The changes in rice properties during aging have been reported to depend upon variety and storage conditions. The changes have been attributed to the changes in cell wall and protein, interaction between proteins and breakdown products of lipids oxidation, and starch-protein interaction It is therefore important to understand the connection between the storage conditions and the final product, so that we can coordinate our processes in the desired way. The specific objective of this study was to evaluate the effects of rough rice storage temperature, and storage duration on the sensory qualities of the cooked rice.
The data presented in this paper confirm the fact that the storage temperature and time have a significant influence on some of the sensory properties of cereals. Therefore knowing the effects of the storage temperature and time can lead to an improvement of these properties and it can avoid the degradation of the sensory properties of the stored products.

Keywords: rice,low temperatures, sensory qualities

1. INTRODUCTION

Cultivated rice at present sustains two-thirds of the world's population. A small amount of the rice crop is used as ingredients in processed foods and as feed, but the bulk is consumed as cooked rice. This pattern of usage results in the need to store rice over varying periods. During storage, a number of physico-chemical and physiological changes occur, this is usually termed ageing [1]. Although the mechanism of rice ageing is not fully understood [3], the changes of pasting properties, colour, flavour, and composition of rice can be observed , which affects milling, cooking and eating quality [6,7,8]. The sensory qualities of cereal destined for human consumption have an influence on their economical value on the world market [4,5].
These sensory qualities are influenced by: the type of cereal, climatic conditions, conditions during harvesting and the operations after harvesting (drying, storage and grinding conditions)[10]. It is therefore important to understand the connection between the storage conditions and the final product, so that we can coordinate our processes in the desired way. The objective of this study was to evaluate the effects of rough rice, storage temperature, and storage duration on the cooking properties of rice.

2. MATERIALS AND METHODS

The rice used in the experiment is long grain type from the Jasmine variety, with 20,5% humidity at harvest. Immediately after harvest, the rough rice samples were cleaned in a dockage tester and immediately air-dried at room temperature (»20°C) The moisture content of the rice was measured by drying duplicate samples for 24 h in an air oven at 130°C [9].The rice was prepared for storage and brought to a 12,5%

humidity. The temperature levels used for storage were 5, 20 and 35˚C, and the samples were analyzed after a period of 4 and 20 weeks. Milled rice was cooked (1 part rice, 3 parts water, 20 minutes boiling) [2]. A team of nine tasters was present for the experiment. The intensity of each analyzed attribute was appreciated on a scale from 1 to 8. The reference intensity for each attribute was assured during the whole time of the experiment.

3. RESULTS AND DISCUSSION

Table 1 Effect of storage temperature on sensory quality of cooked rice after four weeks of storage

Sensory characteristics	Storage temperature		
	5 °C	20 °C	35 °C
General impression	4,32	4,27	4,17
Flavor of starch	3,54	3,52	3,45
Rancid smell	2,40	2,23	2,51
Sulfur odor	1,76	1,59	1,17
Strength	2,72	2,76	2,58
Roughness	2,85	2,99	2,99
Hardness	2,98	3,07	3,34
Adhesion to chew	2,89	2,80	2,87
Hygroscopicity	5,77	5,88	5,65
Cohesion	4,96	4,88	4,66

From the data analyzed in the paper we could see that after four weeks the storage temperature has a significant effect on a series of sensory qualities as: sulphur smell, hardness (resistance to chewing) and cohesion of the grain mass. The sulphur smell decreases significantly when the storage temperature increases from 4 to 38˚C. This can be explained through the volatilisation of the components that give this smell at the same time with the increase in temperature.

Table 2. Effect of storage temperature on sensory quality of cooked rice after twenty weeks of storage

Sensory characteristics	Storage temperature		
	5 °C	20 °C	35 °C
General impression	4,25	4,35	4,54
Flavor of starch	3,66	3,58	3,72
Rancid smell	2,60	2,38	2,63
Sulfur odor	0,78	0,69	0,93
Strength	3,16	2,41	2,05
Roughness	2,92	2,78	2,97
Hardness	2,72	2,60	2,94
Adhesion to chew	3,54	3,08	2,65
Hygroscopicity	5,51	5,20	5,35
Cohesion	5,30	4,79	4,33

The sulphur smell decreases significantly after twenty weeks of storage at all storage temperatures. For the samples examined after four weeks of storage, their resistance to chewing increases at the same time with the increase in storage temperature. The samples with a low chewing resistance also show an increase of grain cohesion. After twenty weeks of storage, the increase in the storage temperature causes a decrease of adhesion, adhesion at chewing and grain cohesion. Also we can notice an increase of a rancid smell.

4. CONCLUSIONS

Cooked rice from freshly harvested rice is generally stickier than that from aged rice and is not preferred by people. The changes in rice properties during aging have been reported to depend upon variety and storage conditions . The changes have been attributed to the changes in cell wall and protein, interaction between proteins and breakdown products of lipids oxidation, and starch-protein interaction.

The data presented in this paper confirm the fact that the storage temperature and time have a significant influence on some of the sensory properties of cereals. Therefore knowing the effects of the storage temperature and time can lead to an improvement of these properties and it can avoid the degradation of the sensory properties of the stored products.

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