Post-storage sensory quality of apple varieties

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Summary:The changing situation of apple production in Hungary has given rise to a great demand for new varieties. Besides bearing capacity, fruit quality and suitability for new training systems, consumer preference is one of the grower's main considerations. Growers need reliable information in order to choose the appropriate variety, so consumer tests have become essential. Altogether, 11 traditional and new varieties were involved in this project. In the first part of the experiment, panelists ranked the coded samples according to their appearance. In the second part, apples were cut into unpeeled slices and the samples were also coded. The assessors were asked to taste them and rank them again. The sensory tests were held after three different storage periods.

Introduction

Hungarian apple production is currently undergoing rapid changes. The main commercial orchards are well past maturity, so an urgent task is to substitute them with plantations based on more recent intensive training systems (Gonda, 1995.). With the settlement of land ownership, the establishment of new orchards can begin. The success of this high investment demanding process depends on the choice of appropriate varieties and clones.

Some of our so-called traditional varieties are already out-of-date; they are not competitive in the market, so the introduction of new varieties is essential. Neither in the respect of bearing capacity, or in the respect of fruit quality can they compete with the new varieties. Due to continuous breeding a large assortment of new varieties is available (National Agricultural Qualifying Institute 1996, Zech, 1989., Stebbins et al., 1991., Kappel et al., 1992.). Especially intensive breeding activity has been done in the selection of disease resistant (e.g.: scab resistant) varieties. The benefit of these varieties are their lower growing costs and the moderate use of pesticides they require. According to experiments (Work et al., 1994., Granger et al., 1992.) the sensory features of these resistant varieties are promising.

The changes of possible markets also make it neccessary to transform the structure of apple production. Our principal former markets have disappeared, so apples of average quality cannot be sold in large quantities any more. Because of this, high quality of apple should become a main concern (Gonda, 1995). In order to accomplish this, new varieties are required.

To be able to choose the appropriate variety, the grower should know not only the variety's main characteristics, but also the consumers' preference. Without that growers take great risk in changing varieties because the advantages of the new cultivars can be realized only through the successful sale of apples.

At the level of sensory analysis it is especially true, that the positive correlation between the results and the features of the product depends primarily on the experiment being properly designed and carried out. The demand that an experiment be reproducible, for example, the results of analytical and instrumental measurements, is increasing. To obtain international reproducibility it is essential to apply ISO standards when screening by panelists, designing and conducting the test sessions and evaluating results (Erdélyi, 1997.). The importance of the reproducibility of sensory analysis experiments is indicated by the fact that 19 ISO standards already deal with the methodology of sensory analysis. Twelve ISO standards have been created since 1985. This indicates the rapid increase in developments in the course of the last ten years.

The present publication introduces some results of a recent experiment, as the sensory quality of the apple varieties were examined after different storage periods.

Experimental design

In the first stage of the experiment the questions to be asked are decided upon. It is advisable to limit the number of questions to those that elicit only the most important information since a high number of negligible questions would unnecesarily burden the assessors and lower the significance level of the results. Subsequently the test method is chosen according to the questions. After this a plan is made, a so called design for the experiment. The main design types differ in sample positions and sample numbers in a block. The most frequently applied design types are: 1, Complete Random Block Design, 2, Balanced Complete Random Block Design, 3, Balanced Incomplete Block Design and 4, Unbalanced Incomplete Block Design (*Cochran & Cox*, 1950, *Mailgard*, 1992, *Erdélyi*, 1996).

If more than six samples must be ranked – like in this experiment –, the Balanced Incomplete Block Design should be applied (*Cochran & Cox*, 1950, *Erdélyi*, 1996). In this case the assessors receive only a part of the whole sample series, but because of the discrete assessor number / sample number combination the experiment can be evaluated statistically as if each assessor had received every sample.

The present experiment was designed to compare Hungarian consumers' preference for the new and the traditional apple varieties. On the other hand, an evaluation of consumer rankings after different storage periods was also made.

Experimental procedure

The sensory sessions were undertaken after different storage periods of apples, at 3 different dates. The participants were inexperienced assessors, mainly students and university workers.

Altogether, 11 varieties were involved in the experiment: 'Elstar', 'Granny Smith', Idared', 'Jonagored', 'Jonathan', 'Jonica', 'Kovelit', 'Lysgolden', 'Mutsu', 'Royal Gala' and 'Redspur Delicious'.

It should be mentioned that from the varieties 'Kovelit' and 'Royal Gala' a smaller sample was available that was enough for only the first two sessions. Therefore those varieties had to be omitted from the third evaluation.

The task of the assessors was to create a simple ranking in two ways. In the first case the samples were whole apples arranged in crates; the apples were coded and their ranking was to be made according to their appearance by numbers from 1 to 11.

In the second assessment the samples consisted of unpeeled apple slices, placed on white paper trays. The assessors did not receive individual trays, but the samples of each variety were placed on different trays and the assessors were asked to create a ranking by tasting these samples.

The two series of samples were separated to avoid the so called halo-effect (*Tomcsányi*, 1988, *Mailgard*, 1992) which occurs if the assessment is made on the basis of more than one property at the same time. In this case the evaluation of one of the properties influences the evaluation of the other. In our case the assessment made on the basis of appearance

of the apple would have had an impact on the ranking given according to taste.

Data processing

The questionnaires were processed at the Sensory Analysis Laboratory of the Szent István University, Budapest. The newly developed ISOSENSE sensory analysis supporting software was used for the processing.

The ranking questions of the experiment belong to the group of simple ranking of unknown ranked samples, thus for their evaluation the relevant ISO Standard prescribes the Friedman Analysis (*Friedman*, 1937). Here, the ranking numbers are transformed into points and the F-value calculated according to the number of assessors, the number of samples and the ranking numbers of the features are compared with the critical F-values of the tables. In the diagrams the rank sums were modified, so the higher the rank sum, the more preferred the variety is.

Evaluation of results

First session: 'Royal Gala' and 'Mutsu' were ranked to the first and second position according to taste, however their appearance was the 10th and 11th in the rank (*Figure 1*). 'Elstar' is also preferred more upon taste than upon appearance. In other cases the outer impression was better, and after the tasting those varieties were less preferred (e.g.: 'Idared', 'Granny Smith' and 'Redspur Delicious').

Second session: Compared with the first session, 'Granny Smith' from the first part of the rank moved to the least preferred position, while 'Kovelit' and 'Jonathan' gained better ranking (*Figure 2*). The varieties 'Mutsu' and 'Elstar' were better accepted according to taste. 'Jonica' and 'Kovelit' had a good rank of appearance while their flavour was mediocre.

Third session: At the last evaluation 'Mutsu' got a significantly better rating for appearance than previously (*Figure 3.*).
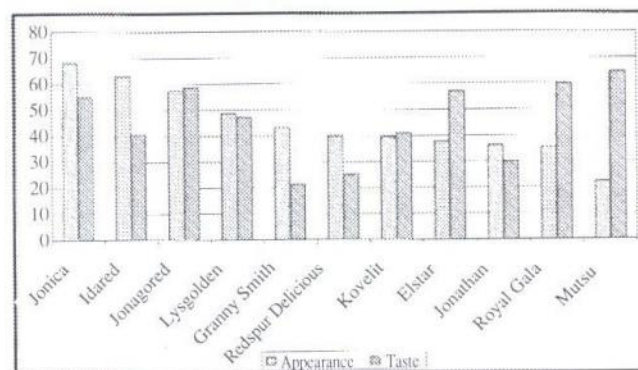

Figure 1 Preference rank of apple varieties according to appearance and taste (09. 09. and 16. 09. 1997., values are percentages of the maximum)
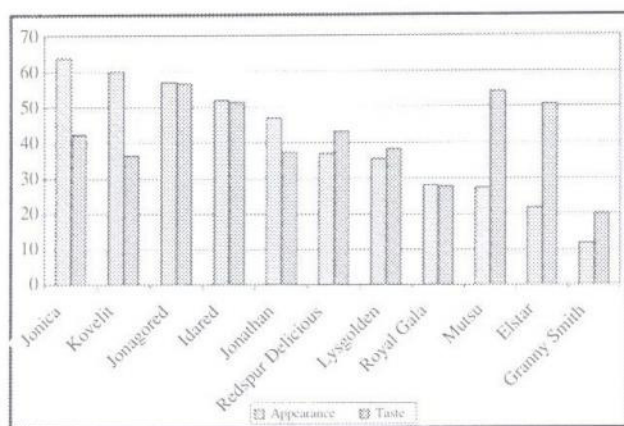
Figure 2 Preference rank of apple varieties according to appearance and taste (11. 11. 1997., values are percentages of the maximum)
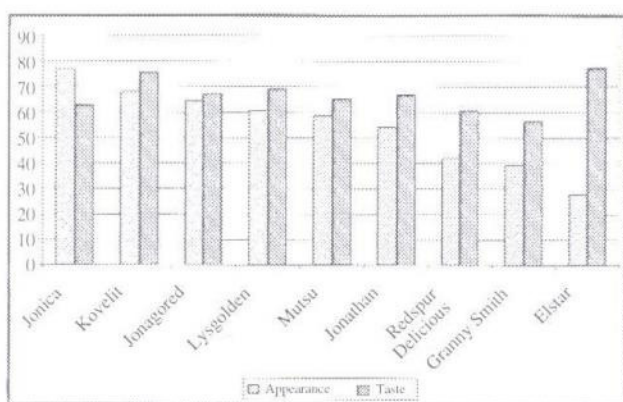

Figure 3 Preference rank of apple varieties according to appearance and taste (12. 10. 1997., values are percentages of the maximum)

Conclusions

On the basis of the experimental results, it seems that the Hungarian consumer accepts the new varieties; both *'Jonica'* and *'Jonagored'* gained good rankings. While *'Jonica'* was preferred mainly on the basis of its appearance, *'Jonagored'* was well ranked in the taste sessions. *'Mutsu'* was also preferred for its taste, although its overall acceptance was not as balanced as that of the two varieties previously mentioned.

As far as the traditional varieties are concerned *'Idared'* was ranked second in appearance. After the tasting tests, the samples of *'Idared'* fell somewhat behind. *'Jonathan'* received positions in the second half of the ranking, in all cases.

The varieties *'Royal Gala'* and *'Elstar'* generally performed moderately in the central range or in the second half of the rankings. Both varieties were better accepted according to the taste.

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