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IMPROVING THE KEEPING QUALITY OF CANNED GREEN PEPPER

PUAN BTE SALIM*, MOHD. NORDIN MOHD. SOM* AND MUHD. BAKRI TUKIMON*

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RINGKASAN

Kajian telah dijalankan ke atas penyimpanan sulah hijau dalam tin. Enam komposisi larutan telah disediakan dari naterium klorid, kalsium klorid dan asid sitrik. Biji lada telah dibahagi kepada tiga peringkat kematangan iaitu tua, muda dan amat muda. Didapati larutan yang mengandungi 2% naterium klorid, 0.2% kalsium klorid dan 0.2% asid sitrik dapat memanjangkan jangkamasa penyimpanan hingga satu tahun.

INTRODUCTION

World consumption of the various forms of green pepper products are estimated to be at 1 150 to 1 430 tonnes per annum. A growth of about four percent to five percent has ben forecasted, implying a demand of around 2 000 tonnes in 1990. About 80%–85% of the total consumption is in the form of green pepper preserved in brine (UNIDO Report 1980). The major markets for this product are the Federal Republic of Germany, France, Switzerland and Sweden. Madagascar was the first supplier of this product which was followed by Brazil and India (GOVINDARAJAN, 1977; NAIR, 1981).

The product was introduced into France as early as 1960 where it was used primarily in the preparation of green pepper steaks or 'steak au poivre' by luxury restaurants. It was also used for garnishing other meat dishes and in the production of a wide range of green pepper flavoured products (JONES, 1976; MATTSON, 1979).

Malaysia is one of the main suppliers of the two traditional pepper products (black and white) which accounts for 29% of the total world export. However, due to the tough competition in the world market, it is imperative that the types of pepper products exported from Malaysia be diversified. Earlier work on canned green pepper was carried out by NORDIN (1978) using matured berries packed in two percent brine. After three months of storage, it was found that the berries became extremely soft, the packing solution changed from yellowish green to dark brown and yellow deposits began to appear on the berries. The main objective of this investigation was to prevent discoloration of the packing solution and inhibition of yellow deposits on the berries by monitoring the maturity of berries and formulating the composition of the packing solution.

MATERIALS AND METHODS

Raw Material and Preparation

Pepper berries (*Kuching* variety) were taken from MARDI plot in Serdang. The freshly harvested berries were divided into three stages of maturity based on colour, texture and starch content (PEARSON, 1970) as shown in *Table 1.*

The berries were manually stripped from the spikes. They were then immediately immersed in 2% brine followed by washing in running water to get rid of undersized berries and extraneous matter.

Canning Procedure

The berries were given preliminary cooking by blanching in boiling water at 98°C for three minutes to soften the berries and remove surface coatings *(Figure 1).* The soft berries were removed from boiling water by

*Food Technology Division, MARDI, Serdang.

Table 1. General descriptions and starch content (diastase method) of pepper berries at different stages of maturity

Stages of maturity	Colour and texture	Starch (%)
Mature	– Dark green bold berries – Cannot be squashed – Well-formed endocarp	11 – 18
Young	– Light green in colour – Can be squashed – Endocarp not well-formed – No milkish secretion	5 – 11
Very young	– Very light green in colour – Can be easily squashed – Has milkish secretion	2 – 5

sieving and immediately filled into cans (internally lacquered). The cans were then filled with hot packing solution (80°C), followed by exhausting in steam for five minutes, sealed and processed for eight minutes at 0.75 kg/cm^2 (10 p.s.i.) in a stationary retort. After processing, the cans were cooled in running water and stored at room temperature (27°C).

Packing Solution

Six sets of packing solution were formulated using sodium chloride, citric acid and calcium chloride as listed below:

Treatment

1. 2% sodium chloride
2. 2% sodium chloride + 0.2% citric acid
3. 0.1% calcium chloride + 2% sodium chloride + 0.2% citric acid
4. 0.2% calcium chloride + 2% sodium chloride + 0.2% citric acid
5. 0.3% calcium chloride + 2% sodium chloride + 0.2% citric acid
6. 0.4% calcium chloride + 2% sodium chloride + 0.2% citric acid.

Storage and Analyses

Two samples from each treatment were observed every two months and compared with a freshly prepared sample (control) by a group of 10 trained panelists. The parameters observed were the colour of packing solutions, colour of berries and appearance of exudates or yellow deposits on the berries. The pH values of the packing solutions and the berries were determined separately. The pH meter was standardised against buffers at 4 and 7. The pH of the packing solutions (20 ml) were taken without dilution. The pH of berries were determined by squashing 10 g of berries followed by dilution with 10 ml distilled water.

RESULTS AND DISCUSSION

pH of Peppercorns

Peppercorns are low-acid fruits. The mean pH of which varies with maturity. The mean pH of fresh matured and young peppercorns used in the experiment were 6.0 and 5.8 respectively. SANE, POWERS, MORSE and MILLS (1950) pointed out that the pH of the raw product varies with season and maturity as determined in pimento pepper. This finding was reaffirmed and extended by FLORA, HEATON and SHEWFELT, (1978). The pH of peppercorns was also found to vary with locality. Madagascar peppercorns have a mean pH of 6.6 (POWERS and SHINHOLSER, 1979), which was higher than Malaysian peppercorns.

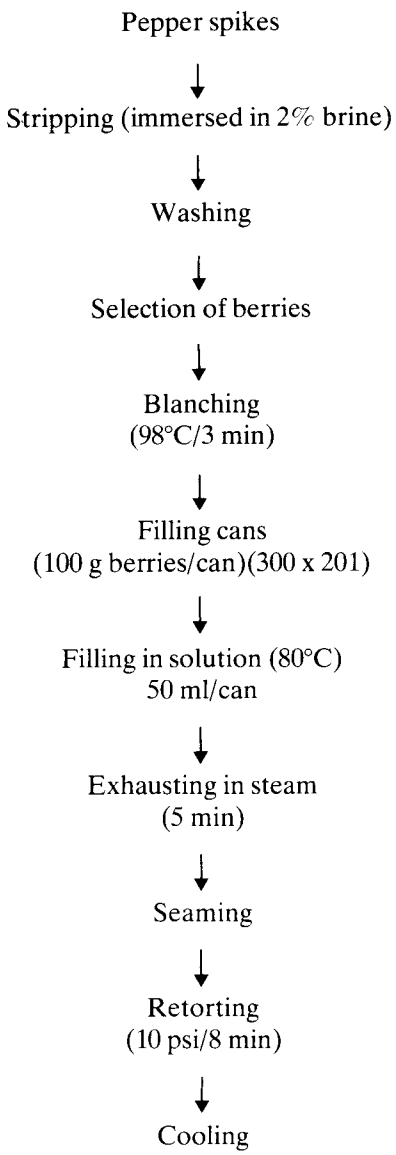

Figure 1. Canning of green pepper ***(Piper nigrum*** Linn*).*

The pH of canned peppercorns was affected by the presence of an acid in the packing solutions. It was found that an addition of 0.2% citric acid decreased the mean pH of berries at all the three stages of maturity. The mean pH of mature, young and very young canned peppercorns were 4.6, 4.2 and 3.7 respectively. Thus this exempted canned pepper from the thermal – processing regulation required for low-acid foods (FEDERAL REGISTER, 1979).

pH of Packing Solution

The mean pH of the packing solution of canned pepper also varies with maturity of the berries. The packing solutions of very young, young and matured peppercorns have mean pH of 3.5, 4.1 and 4.4 respectively. Generally the mean pH of the packing solution is slightly lower than that of the berries at all three stages of maturity and the values remain stable throughout the storage period of one year.

Changes in Colour of Peppercorns

Fresh peppercorns are grass green in colour due to a mixture of chlorophyll 'a' and chlorophyll 'b'. Under moist heating condition which occurred during blanching, the chlorophyll is converted to pheophytin which changes the berry colour from grass green to olive green (DESROISIER and DESROISIER, 1977). During storage, it was found that samples packed in solution containing sodium chloride as the only preservative turned dark brown after one month of storage. Addition of 0.2% citric acid into the packing solution improved the green colour of the berries up to three months of storage only. It was found that the presence of calcium chloride at 0.2% enhanced the green colour of the berries at all the three stages of maturity but sloughing of epidermis was observed on matured berries after five months of storage.

Changes in Colour of Packing Solution

After canning the colour of packing solutions changed from colourless to light yellow. During storage it was found that packing solutions containing 2.0% sodium chloride as the only preservative changed to dark brown after one month. Addition of 0.2% citric acid into the packing solution was found to overcome the discolouration problem. This agrees with the findings of MATTHEW and SANKARIKUTTY (1977) that

addition of an acid improved the preservation and prevented discolouration of canned pepper. Acidification of a product with an acid lowers the pH, inhibit microorganism as well as enhancing the flavour of product (NICKERSON and RONSIVALLI, 1976).

Appearance of Exudate

A good quality canned peppercorns should remain intact without accumulation of yellow deposits. However, because of the prolonged heat treatment during canning, the peppercorns tended to become very soft and some berries burst with subsequent liberation of yellowish exudates resulting in an inferior product. The exudate was piperine (a chemical which is responsible for pungency) and a small portion of two other alkaloids (ROBINSON, pers comm. 1974). The amount of exudates was found to increase during storage, the quantity varies with the stages of maturity of peppercorns and the amount of sodium chloride and calcium chloride in the packing solution. The amount of exudate was higher in mature than young and very young berries. This may be attributed to ruptured epidermis which occurred during heating and thus facilitated the liberation of gelatinized starch. Rupturing of epidermis did not occur in young and very young berries, thus less exudate was observed. MATTHEW and SANKARIKUTTY (1977) recommended that for processing of canned pepper, harvesting must be done about a month earlier than the normal harvesting for black pepper processing. At this stage, the starch and fibre content are lower while the piperine content is higher than matured pepper harvested for black pepper processing.

Trace amount of exudate was observed in matured and young peppercorns packed in solution containing 2.0% sodium chloride and 0.2% citric acid after three months of storage. There was no exudate presence in matured peppercorns packed in solution containing higher percentages of sodium chloride (3.0% and 4.0%) but the end product was found to be too salty for direct consumption.

Addition of calcium chloride at 0.2% in the packing solution was found to eliminate the exudation problem in canned peppercorns at all the three stages of maturity. Thus addition of calcium chloride at 0.2% and more greatly enchanced the firmness of pepper berries and inhibited exudation. DESROISIER and DESROISIER (1977) found that addition of calcium salt to fruits establishes a calcium pectate gel which supports the tissues and maintains the structure even after being heat processed.

CONCLUSION

Following the above discussion, it can be concluded that discolouration of the packing solution in canned peppercorns can be prevented by addition of 0.2% citric acid. The exudation problem can be eliminated by addition of 0.2% calcium chloride without having to increase the amount of sodium chloride in the packing solution. Young peppercorns are more recommended for canning because of the lower starch content than matured berries and no rupturing of epidermis occurred during blanching.

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SUMMARY

Studies were conducted to investigate the keeping quality of canned green pepper. The packing solutions were formulated using sodium chloride, calcium chloride and citric acid. The berries were divided into three stages of maturity i.e. mature, young and very young. It was found that addition of 0.2% citric acid and 0.2% calcium chloride in the packing solution can prevent discolouration and exudation of gelatinized starch up to one year of storage.

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