Review on the Effect of Postharvest Treatment on Potato Quality

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Abstract

Research on tuber quality, storage, and processing was carried-out. Research emphasized on the evaluation of clones for processing quality, on-farm evaluation of promising storage technologies, and application of techniques to control postharvest losses due to pest and diseases, transportation, storage and marketing to aid in the management control at pest and disease and in the process upgrade of participating of laboratories, stores and farmers practices. Research on improving of processing method is needed to increase the quality of product including flavor. Research on packaging is mainly concentrated on the development of suitable packaging system for the product.

Keywords: post-harvest treatment, potato, quality, income.

Introduction

Among major vegetables, potato is potential to increase small farmer income, since potato is economically competitive vegetable. Potatoes are highly demanded by food industries such as french fries restaurants and potato chips industries. As estimated by World Bank, vegetable and fruit consumption in Indonesia increased approximately 3.9% during the period of 1995-2010 (Pasandaran & Hadi 1994). Demand projection to overall vegetable increases by 4.1% every year (8.2 to 12.3 million tons every year, Van Lishout, 1992).

The major challenge for Indonesian agriculture is how to produce high quality of potato at affordable prices that fit into the demands as rapidly growing population. It was clear that AARD plays an important role on vegetables quality. Postharvest technology increases product quality and reduces losses. Loss assessment of poor postharvest technology is estimated about 20 – 40% (Winarno & Aman, 1981).

Basic research program has to emphasize on strengthening the vegetable quality by improving efficiency of farming techniques, utilizing of the valuable domestic resources wisely to endure food safety, efficiency on management, food security and agribusiness development. Determination of some pre and postharvest treatment were evaluated for potato quality. Pre-harvest treatment commonly concerned with variety and harvest time, whereas postharvest concerned with fresh handling and processing.

In Indonesia, there are a few research on postharvest aspect of potato have been carried out. Postharvest experiments so far concentrated on the storage and handling of seed and potato tubers. In this paper we summarized the postharvest treatment affected the quality of potato.

Material and Methods

Several reports provided by IVEGRI were available fragmentally. Reserach started from potato varieties up to postharvest have been done, however, they need more improvement. Sequence of postharvest information were hardly found, however, some crop varieties, some postharvest experiments on various crops and some agronomic aspect methods were described

briefly. Field testing design commonly used were randomized block design, whereas in the laboratory most research were carried-out by complete randomized design with sufficient replication related to number of treatments. Postharvest treatment methodology related to the some vegetable varieties testing were mainly based on physical characterization, chemical analysis method and organoleptic test.

For potato varieties testing, 2-5 g sample was placed in 250 ml flask added with 50 ml of alcohol 80% and stirred for 1 h, then they were filtered and cleaned. The filtrate of 250 ml contained carbohydrate. Starch in filtrate as a residue were put on filter paper, and washed 5 times in 10 ml of ether, then let these samples to evaporate and they were rewashed by 150 ml of alcohol 10% to obtain free dissolved carbohydrate. Residue was removed and placed in an erlenmeyer flask through washing by 200 ml of aquadest then added with 20 ml of HCl 25%, covered with cooler lid, and boiled for 30 min. After that they were cooled down by NaOH 45% and diluted to 500 ml. Filtered and determined the sugar content as glucose from the filtrate. Determination of starch content was calculated by glucose weight times factor 0.9. Crop hardness was measured by penetrometer, and organoleptic test was carried-out by hedonic method.

Results and Discussion

Storage of seed potatoes

An experiment was conducted to compare the effect of diffuse light and dark storage of tuber seed on yield of patato by Sihombing (1986). This experiment was carried out at hight land Ciwidey at West-Java, (1080 m above sea level) on a farmer field in both dry and wet season. A randomized block design of non-factorial was applied with two storage method having 12 replicates on each season. The results indicated that the seed tubers stored in diffuse light storage showed better plant vigour and gave yielded increases from 16.9 to 26.9%, compared with tubers stored in the dark.

The effect of storage method and delay in planting of tuber seed on yield and quality of potato tubers was carried-out by Nainggolan (1993). A randomized block design with three replicates was used in this experiment. Two methods of storage used tuber seed (in dark and diffuse light) and planting periods (5 months of storage as control). The results showed that storage of tubers seed in diffuse light storage increased the yield up to 15.02% and the quality of tuber was better compared to dark storage. The delay in planting of tuber seed decreased the yield to 27.50 g/seed/plant and showed lower quality tuber.

Potato seed storage in mid-elevation area with diffuse light storage was done by Asgar and Asandhi (1994). The planting time of mid-elevation potato was in May to June, while the tuber seed used was harvested in December, long storage of potato seed affected poor quality of seed. One way to overcome the problem was by using diffuse light storage. Six varieties of potato used diffuse light storage. Six varieties of potato (Granola, Red Pontiac, Cosima, Monza, Cipanas, and Berolina) were stored in diffuse light storage and dark storage by using randomized completely block design with six replicates. The results showed that after four months storage the percentage of rotten tubers of Granola was 69%, although diffuse light storage was better than that in dark storage in terms of higher number of sprout, shorter, bigger and more healthy.

Storage of ware potatoes

Study on storage of ware potato and the loss due to storage method was conducted by Asgar and Asandhi (1990). Thirty farmers was sampled for interview. The results showed that some farmers stored their ware potato for several days until two months when the market price as low (Asgar, 1990). Two method of storage was used in the field (either covered delaying the harvest or pilled beside the field and covered with canvas) or in the storage which was usually seed storage.

The average loss was 7.1% for farmers having less than 1 ha land and 9.3% for farmers having 1 ha or more land. The highest loss was recorded at 25%.

Improvement of ware potatoes store method was carried-out by Asgar and Asandhi (1991). A two-layer of box was made in the storage. The distance between the two layers was 14 cm and filled up with rice husk. The box was divided into 12 parts to place the experimental unit consisted of four treatments and three replicates. The size of the experimental unit was 104 cm length x 77 cm width x 44 cm depth. The design used was randomized completely block design. The treatment was pilling potato tubers with: 1) vertical without ventilation, 2) horizontal without ventilation, 3) vertical with ventilation and 4) horizontal with ventilation. The ventilation made from proliferated tube was put vertically into the pile. The size of the tube was 74.5 cm of length, 8.5 cm of diameter, and the number of holes was 20. From this study could be concluded that ware potato storage using double layers of wall and filled up with rice straw could be introduced to farmers in the highland, since the temperature in the tubers piles was not significantly different with the room temperature. However, pilling the tubers horizontally was better than vertically as done by the farmers.

Experiments on the harvest time and storage period was done by Asgar and Marpaung (1997). Seed tubers with the size of 25 to 45 g/tuber collected from Pangalengan were planted at the experimental area at the Indonesian Vegetables Research Institute. The seed tubers were 72/plot. Fertilizing and maintanance at the field was conducted at the Indonesian Vegetables Research Institute recommendation. Manure was given side of planting with dosage of 30 tons/ha, ZA at 100 kg/ha, TSP at 250 kg/ha and KCl at 300 kg/ha. Seed tubers were planted with the sprout of 1 to 2 cm length and planting distance 80 x 30 cm on matches. A split plot design was used and plants were harvested on day 70, 80, 90, 100, and 110 days. Sub plot was storage period consisted of 1, 2, 3, 4, and 5 day. The result showed that harvest time of 100 after planting yielded good quality as evaluated by panelist. The best characteristic was found for tuber harvested on 100 days after planting and stored for two days.

Processing

The best variety for chips was Atlantic as investigated by Asgar and Kusdibyo (1997) using method as follows: seed tubers of 25–45 g/tuber collected from the farmers in Pangalengan and Wonosobo were planted at the experimental area of IVEGRI. The seed tubers were 72 per plot. Fertilizing and maintenance at the field used IVEGRI recommendation (1994). Manure was given side of planting with dosage of 30 tons/ha. Artificial fertilizer used at planting time were Urea at 200 kg/ha, ZA at 100 kg/ha, TSP at 250 kg/ha, and KCl at 300 kg/ha. Seed tubers were planted with the sprout of 1–2 cm in the length and planting distance was 80 x 30 cm on matches. A split plot design was used in this research and every treatment combination was repeated three times. A main plot was varieties consisted of Atlantic, Latif, and Granola. A sub-plot was harvest time consisted of 90, 100 and 110 days. The results showed that the quality of Atlantic variety and harvest time of 100 days were the best than the others in terms of the colour, brittleness, taste and appearance.

The chipping quality of 45 advanced potato clones was determined by Asgar and Chujoy (1999). The results showed that best clones with chipping scores ranged from 1.0 to 3.4 (light yellow to dark yellow) which were: I-853, ASN-691, Muziranzara, CFJ-691, CEW-691, Atlantic, ABZ-69-1, TS-2, VC24.16, Cruza-148, LT-5, Monsama, P-4, TS-13, 379706.34, 283232.11, CCN-69-1, MF-II, CFM-69-1, 3806010.14, 378501.3, Chiqita, Graso-28, I-1150, AGB-69-1, Desiree, I-11035, Cruza-27, and Precodepa.

Research on the evaluation of 12 potato processing clones was conducted by Basuki *et al*. (2003). Experimental area used was at 4 locations i.e: Pangalengan, Garut, Batur (Middle Java), and Tosari (East Java). Industry for potato chips modern scale, two home industries, and 42 farmers were interviewed to evaluate the production character, tuber quality, specific gravity, appearance and process product taste from 12 potato processing clones. The results showed that 380584.3 and FBA clones were preferred by farmers, home industry, and consumer. FBA-4 clone

coled be developed for modern industry with good handling. TS-2 and MF-II were received by modern industry processor as raw materials. These clones could be released as new variety for processing. The product of TS-2 was equal to Atlantic and Panda and product of MF-II was higher than that of the Atlantic and Panda.

Basuki (2005) showed that according to resistance of the leaf rotting diseases and swollen root nematodes, 380584.3, TS-2, FBA-4, I-1085 and MF-II clones were resistance. This figure was achieved from ten experimental areas which were 380584.3 resulted in 33.5 t/ha, TS-2 was 22.4 t/ha, FBA-4 was 28.1 t/ha, I-1085 was 25.3 t/ha and MF-II was 30.1 t/ha, respectively. Furthermore, he stated that the use of FBA-4, TS-2 and MF-II clones were suitable for raw materials of potatoes chips for modern industry, while 38058.4.3 and I-1085 were suitable for home industry and middle class.

Research on distribution of taste on potato slices was conducted by Kastaman *et al*. (2000). A completely randomized block design was used in this research. First factor was potato cultivar consisted of: Atlantic and Granola. Second factor was Sodium Metabisulfite concentration at 500, 750, and 1000 ppm. Third factor was ingridients consisted of: 1) salt, 2) salt and broth, 3) salt and chicken curry, 4) salt and meat simmered in spices and coconut milk, and 5) salt and pepper. The results showed that for Atlantic cultivar, dipping with sodium metabisulfite treatment was not significantly different on the colour, flavor, hardness and taste of potato chips. On Granola, there was a significantly different on organoleptic characters (colour, taste, appearance). Increasing in Indonesian spices such as *kaldu ayam* (chiken broth), *kari ayam* (chiken curry), *rendang* (meat simmersed in spices and coconut milk), and pepper gave significantly different to increase in consumer preference on organoleptic test. There was an interaction between cultivar and sodium metabisulfite concentration on the quality. Economic analysis for potato chips on the estimation of cost price production of Atlantic cultivar was Rp. 15.711/kg. The price of chips was Rp. 16.750/kg, whereas the price of raw materials was Rp. 4000/kg. For estimation of cost price of Granola cultivar was Rp. 13.211/kg and a sell price of chips was Rp. 14.240/kg with buying price of raw material at farmer level Rp. 1500/kg.

Quality assessment for several clones has already done by Asgar *et al*. (2010). The objective of this research was to test for clones/cultivars selected from the yield and quality. Quality test of 10 selective clones was determined. This research was conducted from July to September 2010. The research was arranged in randomized block design. The results showed that chips which having value between 2.00 and 2.36 (yellow uniform) for potato chips was clone 7 (391011.17 x 385524.9). Reduction sugar content from this clones were assumed to lower than reduction sugar content of the other potato clones having dark colour.

Conclusions

Considering the increasing demand for processed potato products, a systematic evaluation of cultivars and clones for processing quality would decrease high research priority. On-farm evaluation of promising storage technologies for seed and ware potatoes that have already been tested elsewhere should also be emphasized. Application of technologies to control postharvest losses due to pest and disease, transit, storage, and marketing were to improve the management control at pest and disease and in the process upgrade of participating of laboratories, stores and farmers practices. Research on improving of processing product is needed to increase in the quality including taste pass through giving spices (flavour). Research on packaging is mainly concentrated on the development of suitable packaging system for the product.

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