EvaIuation of plant crop of introduced banana clones and the effects of packing on fruit quality

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ABSTRACT

Experiments were conducted at the National Institute for the Promotion of Horticultural Exports (NIPHE), University of Gezira, Wad Medani Sudan, during the period of June 1997 to October 1998, to evaluate yield and quality of banana clones introduced from France as to the local cultivar Dwarf Cavendish. The clones included Williams hybrid (WH) 172, 1280, 1281, 1223 and 1266 and Grand Nain 1824. The experiments were arranged in a completely randomized design with three replications. Experiments also included the use of different packaging treatments and their effects on weight loss of banana fruit stored at either 20 or 32^0C. The results showed that the clones GN 1824 and WH 172 resulted in the highest yield, bunch weight, number of hands per bunch, number of fingers per hand and the best finger dimensions. Weight loss for banana fruit held at 20C˚ was significantly lower than that obtained at 32C˚. At both temperatures, unwrapped fruits resulted in significantly higher weight loss followed by fruit packed in perforated polyethylene bags. The intact bags recorded the lowest fruit weight loss.

INTRODUCTION

Banana (*Musa spp*) is among the most important fruit crops in the world. It originated in South East Asia (Simmonds, 1966). Banana today in grown in every humid tropical region and constitutes the fourth largest fruit crop in the world, following grapes, citrus fruits and apples (Morton, 1987). Banana is a popular fruit with a high nutritive, relatively low price, and available all year round. Total world production is over 76 million tons, of which the exports represent less than II million tons worth about 6 billion US dollars (Robinson,1995).

Banana can be successfully grown in many parts of the Sudan, yet banana culture has not received much attention in the past. World markets in the Gulf and east of the Mediterranean import 750 thousand tons of banana from the Caribbean, South America and Philippines, worth about 360 million US dollars (Robinson, 1995). Sundanese harbours are a few days from the Gulf States as compared to a two weeks journey by the steamers from the major supplying countries. For these reasons, banana industry in Sudan is attracting much attention on both public and private levels and there is an increasing interest in the production of banana for both local and world markets.

The commonly grown cultivar in Sudan is the Dwarf cavendish which is a low yielder and does not meet international fruit quality requirements. Therefore, there is a need for the introduction and evaluation of other clones and cultivars which are accept in export markets. The objectives of this research are to evaluate introduced clones and cultivars of bananas and improve postharvest handing practices through the use of polyethylene packaging.

MATERIALS AND METHODS

Field evaluation of the banana clones and cultivars

Banana clones were introduced from Vitropic tissue culture laboratories (France) at the plantlet stage. The clones were Grand Nain (GN) 1824 and Williams hybrid (WH) clones 172, 1280 1281, 1223 and 1266. These clones were compared with the local cultivar Dwarf Cavendish (DC). Introduced clones together with Dwarf Cavendish cultivar were transplanted in June 1997 in a private orchard at Hantoub, Wad Medani, Sudan, along the east bank of the Blue Nile. They were arranged in a completely randomized design replicated three times with four mats per replication. Standard cultural practices of irrigation, fertilization and weed control were carried out . Nitrogen the form of urea was applied at the rate of 200 kg N/ha. Spacing was 3 x 3m. Bunches were harvested at the mature green stage. Data collected included bunch weight, number of hands per bunch, number of fingers per bunch and finger dimensions.

Packaging experiment

Banana fruits were sorted, washed in tap water and then disinfected in a solution of sodium hypochlorite at a concentration of 500 ppm.

Samples of 5 kg of fruit were packed in the following package treatments:
l- Intact polyethylene bags.
2- polyethylene bags.
3- Unwrapped fruit (without bags).

All treatments were placed in cartons and then stored at either 20C˚ or $32C^0$. The experimental design was a split plot design arranged in a factorial arrangement of 3 x 2 with 3 replications. Initial weight was taken immediately and then cartons were weighed daily till fruit were ripe, and weight loss was determined as follows:

$$\text{Weight loss (\%)} = \frac{\text{Initial weight final weight}}{\text{Initial weight}} \times 100$$

RESULTS AND DISCUSSION

Field evaluation of the banana clones and cultivars

There were significant differences between the clones in all yield parameters (Table l). Grand Nain 1824 and WH 172 were significantly superior in all characters tested compared with Dwarf Cavendish. The clones GN 1824 and WH 172 significantly resulted in the highest bunch weight and yield per hectare as compared to the others, where as Dwarf Cavendish resulted in the lowest. Bunch weight and yield of the other Williams clones were comparable.

Table l. Yield and yield parameters of the plant crop of the tested banana clones and cultivars.

Banana clones and Cultivars	Bunch wt. (kg)	No. of hands/ bunch	No. of /fingers bunch	Yield (tons/ha/ Year)	Finger length (cm)	Finger diameter (cm)
WII 172	21.8ab	9.8ab	156ab	51.9ab	216ab	30ab
WII 1280	17.4bc	9.0b	132c	40.5bc	20.6bc	3.3a
WH 1281	19.9bc	8.8b	122c	47.3bc	20.9ab	3.2ab
WH 1366	19.4bc	9.3ab	137b	46.2bc	19.9c	3.1ab
WH 1223	20.5bc	9.3ab	142bc	48.5bc	21.2ab	3.2ab
GN 1824	24.9a	10.3a	161a	59.0a	21.7a	3.2ab
D.Cavendi	15.1 c	8.3b	134c	35.0c	18.5d	2.3c

Means within columns having the same letter(s) are not significantly different according to Duncan's Multiple Range Test.

There were no significant differences between the introduced clones in finger length and diameter (Table 1) Grand Nain 1824 was superior in finger length followed by the other Williams clones. Dwarf Cavendish recorded the shortest finger. There were no significant differences in finger diameter between the introduced clones. However, Dwarf Cavendish significantly resulted in the smallest finger diameter. The long fingers with big diameters of the clone GN 1824 made it a suitable substitute for the locally grown Dwarf Cavendish cultivar.

Packaging results

At storage temperatures of 20 and 32^{0}C, banana fruit packed in intact polyethylene bags significantly resulted in the least weight loss as compared with perforated bags and control treatments (Fig. 1 and 2).

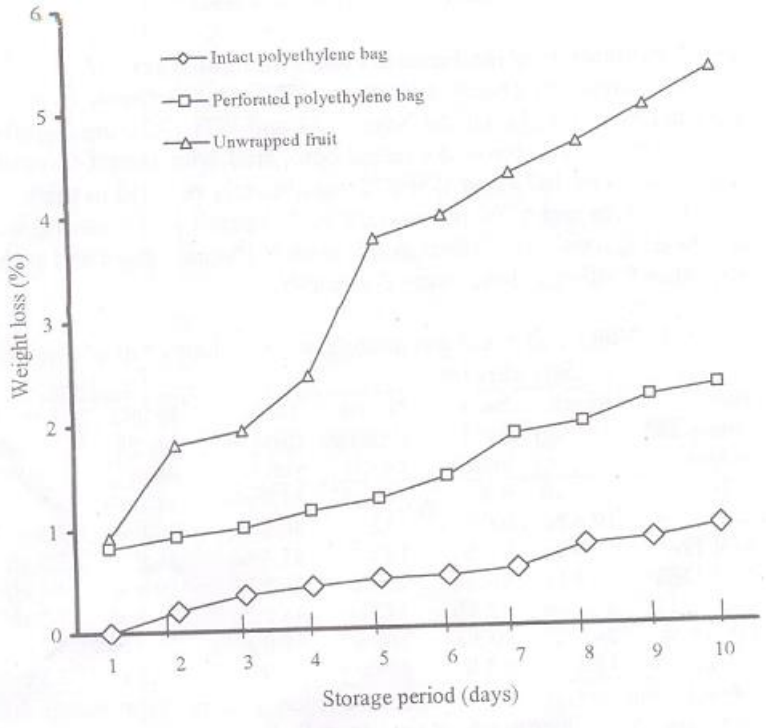

Fig. 1 Weight loss of banana fruit stored at 20˚C with different packaging treatments

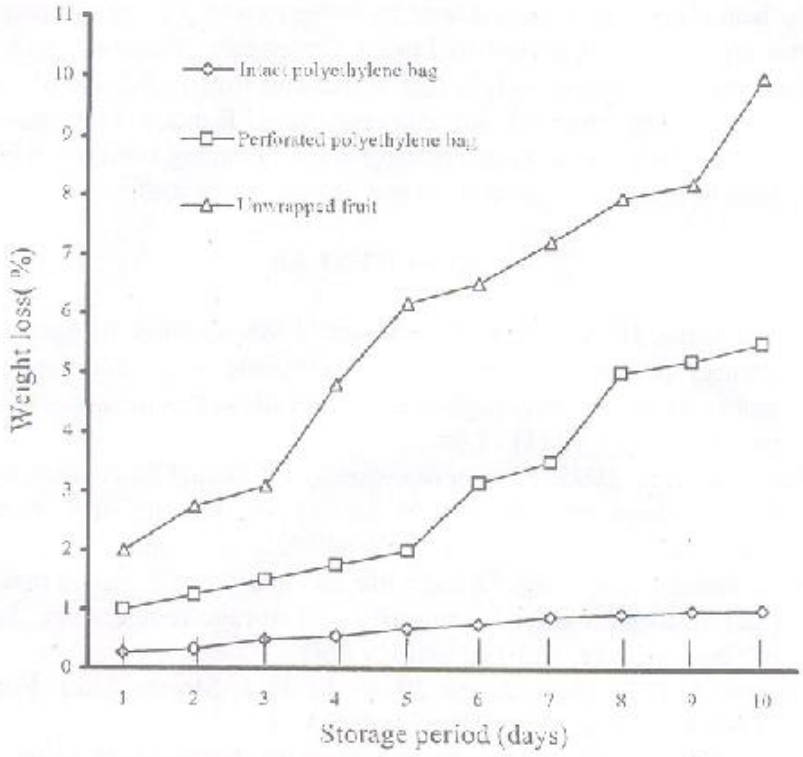

Fig. 2 Weight loss of banana fruit stored at 32˚C with different packaging treatments

Conclusion

The banana clones Grand Nain 1824 and Williams hybrid 172 were the best choice for export due to their high yield per hectare and good fruit quality as compared to Dwarf Cavendish. The best packaging material for reducing weight loss of banana fruit is the use of cartons lined with unperformed polyethylene bags. Banana fruit should be held at relatively low temperature (14-15C^0) during transportation and storage to maintain their quality and reduce water loss.

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