

# Evaluation of the Hass-like avocado cultivars Harvest, Gem and Grace at Westfalia Technological Services

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## ABSTRACT

Trees topworked to 'Hass', 'Harvest' and 'Gem' in 1996, bore their sixth crop in 2004. 'Gem' out-produced 'Harvest' and 'Hass' in the 2004 season by 10 and 5 ton/ha respectively. However, 'Harvest' continued to be the best producer over the six-year period with a cumulative yield of 195 ton/ha. The average size of 'Harvest' and 'Gem' fruit was bigger than the average size of 'Hass' fruit (count 12-16, count 14-18 and count 18-22 respectively). Postharvest fruit quality after simulated shipment was acceptable for all three cultivars, but 'Harvest' fruit, as previously observed, stayed green upon ripening.

In the 2004 season, the experimental evaluation of these cultivars was extended to three other production regions (Kiepersol, Levubu and KwaZulu-Natal).

## INTRODUCTION

The currently preferred avocado fruit size for most markets is in the range of 250-350 g (count 12-16). 'Hass' trees however, have the tendency to produce a large percentage of undersized (<170 g) fruit, especially when trees are under stress. As up to 40% of the crop can be undersized and thus unmarketable, it results in high financial losses for farmers.

Avocado cultivar research at Westfalia Technological Services (previously Merensky Technological Services) has therefore focused on finding a high yielding, better sized, good quality Hass-like cultivar.

Research started in the early 1990's with the importation of 'Lamb Hass' from California and 'Iriet' and 'Gil' from Israel. A selection from the Western Cape, '1.14.2', was also included in the evaluation (Kremer-Köhne, 1999). 'Lamb Hass' proved to be the most promising cultivar as it had a higher cumulative yield than 'Hass', a favourable fruit size distribution and matured two months later than 'Hass'.

However, due to different fruit characteristics, 'Lamb Hass' should not be used as a replacement for 'Hass' but rather as a cultivar to prolong the avocado season (Kremer-Köhne and Köhne, 2001).

The cultivars Sir Prize, Jewel, Nobel (previously BL 667), 8-22-5, Gem and Harvest, from the Californian breeding program, and Bonus, a Westfalia selection, were evaluated by Westfalia Technological Services (WTS) since 1996 (Kremer-Köhne, 2001). Due to unsatisfactory performance the evaluation of 'Sir Prize' 'Jewel', 'Nobel', '8-22-5' and 'Bonus' was discontinued after the 2001 season.

The cultivars Harvest and Gem performed well and cumulative yields were respectively 125% and 20% higher than that of 'Hass' for the three-year period 1999 – 2001 (Kremer-Köhne, 2002). Therefore, evaluation of 'Gem' and 'Harvest' continued. Both cultivars continued to perform well at Westfalia Estate and SAAGA negotiated a test agreement with the University of California for the evaluation of these cultivars in three other South African production regions (Kremer-Köhne & Mokgalabone, 2004). Further, the evaluation of a local selection 'Grace' from the Kiepersol area in Mpumalanga was initiated in 2003. This report is an update on the sixth 'Harvest' and 'Gem' crop harvested at Westfalia Estate in 2004, and progress made with the evaluation of the cultivars in the other production regions.

## MATERIALS AND METHODS

The cultivars Harvest, Gem and Hass were top-worked at Westfalia Estate in 1996. Yield data were recorded as kg/tree and extrapolated to ton/ha for 200 trees/ha. A representative sample of each cultivar was used to determine the fruit size distribution of the cultivars, by weighing fruit individually. A sample of each cultivar underwent simulated shipment of 28 days at 5.5°C in the WTS experimental cold rooms. Upon removal from cold storage, fruit firmness was measured with a densimeter. The densimeter measures firmness by means of a small metal ball pressed onto the fruit and a reading of 100 (hard) to 0 shore (soft) is registered (Köhne, Kremer-Köhne & Gay, 1998). Fruit were also evaluated externally and then ripened in the ripening room at 20°C. The number of days until the fruit ripened was recorded. Thereafter the fruit were evaluated internally. Evaluation was done a scale of 0-3 where 0 depicted no symptom and 3 depicted a severe symptom. Parameters that were monitored included lenticel damage, diseases and physiological disorders. Further, the alternate bearing behaviour of the cultivars Harvest, Gem and Hass was investigated according to the formula of Gur *et al.* (1969). The intensity of deviation in yield in successive years is expressed as the alternation intensity (*I*) where

$$I = \frac{1}{n-1} \left( \frac{a_2 - a_1}{a_2 + a_1} + \frac{a_3 - a_2}{a_3 + a_2} + \dots + \frac{a_{(n-1)} - a_n}{a_{(n-1)} + a_n} \right)$$

*n* = number of years

*a*<sub>1</sub>, *a*<sub>2</sub> ... *a*<sub>(*n*-1)</sub>, *a*<sub>*n*</sub> = yield in corresponding years.

*I* = 0 = regular cropping

*I* = 2 = strong alternate bearing

The calculation in brackets is done without considering the signs of the terms.

In the Levubu area (Springfield Farm) of Limpopo Province, 15 trees each of 'Gem', 'Harvest' and 'Hass' were planted in early 2005. In the Kiepersol area (Danroc Farm) of Mpumalanga Province, 15 trees each of 'Gem', 'Hass' and 'Harvest' were top-worked in 2004 and a first crop can be expected in 2006. In Kwa-Zulu-Natal trees have been stumped in the Howick area (Everdon Estate) to be topworked to the three cultivars in 2005.

'Grace' and 'Hass' trees were topworked at Westfalia Estate in

2003 and a first crop can be expected in 2006.

## RESULTS

In 2004, 'Gem' trees out-produced 'Harvest' and 'Hass' by 10 and 5 ton/ha respectively. However, 'Harvest' continued to be the best producer over the six-year period and out-produced 'Gem' by 57 ton/ha and 'Hass' by 72 ton/ha (Fig. 1). The low alternation intensity of 0.14 calculated for 'Gem', is an indication of its consistent bearing habit. 'Gem' produced more than 22 ton/ha annually for years 2-6 of the study.

However, the alternation intensities of 0.31 and 0.33 for 'Hass' and 'Harvest' respectively confirm these cultivars' tendency towards alternate bearing.

'Harvest' and 'Gem' fruit were larger than 'Hass' fruit. 'Harvest' fruit were mainly in the count range 12-16, 'Gem' fruit in the count range 14-18 and 'Hass' fruit in the count range 18-22. 'Hass' trees also had the highest percentage of fruit (39%) in the unmar-

ketable range of <170 g compared to 19% for 'Harvest' and 24% for 'Gem' (Fig. 2).

Postharvest fruit quality after simulated shipment was acceptable for all three cultivars. As was experienced in previous years, 'Harvest' fruit did not colour up black but remained green upon ripening.

## CONCLUSIONS

The cultivars Harvest and Gem proved to be better producers with a bigger average fruit size than Hass over the six-year evaluation period. Although 'Harvest' trees produced on average 32.5 ton/ha over the six years, the cultivar tends to be alternate bearing. 'Gem' trees, however, are consistent bearing with an average yield of 23 ton/ha over the six-year period. The evaluation of 'Gem' and 'Harvest' at Westfalia Estate was discontinued after the 2004 season, however, the SAAGA funded project is underway to evaluate the cultivars in three other South African production regions.

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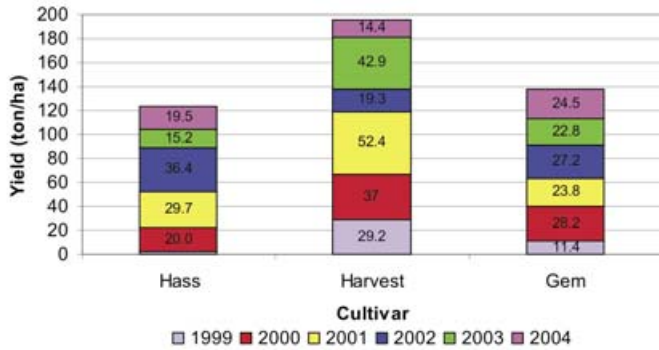


Figure 1. Cumulative yield extrapolated to ton/ha for 200 trees/ha of the cultivars Hass, Harvest and Gem for the period 1999 – 2004.

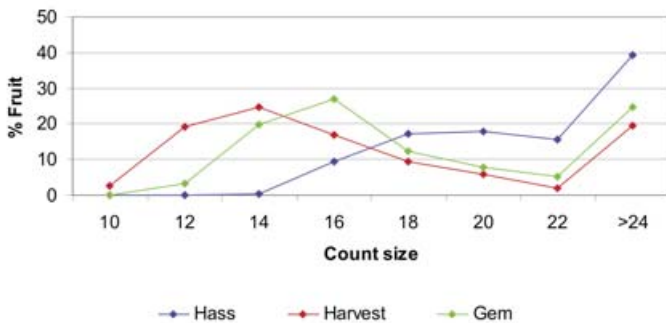


Figure 2. Fruit size distribution of the cultivars Hass, Harvest and Gem in 2004 (count sizes according to a 4 kg carton).