POSTHARVEST EVALUATION OF INTRODUCED FRENCH BEAN (*Phaseolus vulgaris* L.) VARIETIES

[SHORT COMMUNICATION]

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ABSTRACT

French beans (*Phaseolus vulgaris* L.) are major export vegetables in Kenya. New varieties introduced from temperate countries need to be tested for adaptability to local conditions as well as their postharvest characteristics to ascertain that they meet the export standards. Three introduced varieties(R-1516, R-1515 and Lexus) were evaluated for their performance at KARI Thika. The snap beans were grown and harvested in long rains season of 2001. The plants were grown in rows following agronomic recommendations. The pods were harvested when mature at a frequency of 3 times per week, graded and weighed in a general laboratory. Random samples of 2 kg per grade from each variety were taken on the same day and taken to the postharvest laboratory for evaluation. Parameters recorded included number of pods per plant, pod length, pod diameter, seed size, colour of pods, pod appearance, shape and curvature, incidence of fibre, and yield (kg per ha). Variety R-1516 had the highest number of pods followed by R-1515 and Lexus in that order. There was no significant difference in yield, although all the varieties gave an acceptable higher yield compared to the local check (Amy). All the snap beans evaluated had acceptable green pod colour, pod length, pod diameter, pod appearance, seed size, and fibre content. All the introduced varieties can therefore be recommended for production since the pods met the export standards.

Key words: Postharvest evaluation, *Phaseolus vulgaris* L., Varieties.

INTRODUCTION

French bean is a major vegetable export crop in Kenya. In 2005, exported volume was 32,700 metric tons valued at K.Sh. 5.5 billion (HCDA, 2005). It is currently a major income earner for the rural population and is mainly grown by small- to medium-scale growers. French beans have a high nutritional value contributing essential nutrients such as ascorbic acid, Vitamin A, Vitamin B and calcium, among others (Kelly and Scott, 1992). The key destination for this crop is the European Union markets (Ministry of Agriculture (MoA), 2006). The crop has been ranked high by export markets,

but is now faced with stiff competition from other export crops. In addition, there is competition from other countries closer to the export destinations such as Morocco, Ethiopia and Algeria which are able to transport their beans by trucks, and hence earn competitive produce prices (MoA, 2006). The crop is grown mainly under irrigation. Central province is the leading source of the produce generating about half of the total output. Main varieties grown include Julia, Amy, Monel, Samantha, Paulista and Vernadon (MoA, 2006). Some of the constraints faced by the French beans industry in Kenya include: high input costs especially of seeds, pesticides and fertilizers, degeneration of seed saved from previous harvest, seed mix-up, high levels of pest infestation and stringent standards set for the export markets (MoA, 2006). The horticultural programme at the Kenya Agricultural Research Institute (KARI) is charged with evaluation of horticultural crop varieties in collaboration with seed companies. Seed companies introduce new French bean varieties from temperate regions of the world to increase the number of cultivars for commercial bean production. The introduced cultivars are evaluated with a view to overcoming the above-mentioned constraints. However, during the evaluation of these introductions emphasis has mainly been placed on agronomic performance with limited attention given to postharvest characteristics (Ndegwa et al., 1999). Export standards stipulated by the Horticultural Crops Development Authority (HCDA) conform to the international standards and must be met to ensure that any new varieties are profitable to grow and sell in the export markets. There are two main grades: extra-fine and fine, for French beans destined for export, although in some cases a third grade, Bobby is also exported (HCDA, undated). Specific varieties for the Bobby category also exist (HCDA, undated). The extra fine pods should be very tender, seedless and with no fibre. The pod diameter should be less than 6 mm and the minimum length must be less than 10 cm. For the fine grade, the pods may have small seeds and short soft strings. The pod must be 6 mm to 9 mm in diameter, while Bobby grade beans should be more than 9 mm in diameter, fleshy, larger but with low fibre/string content (HCDA, undated).

The present study evaluated three newly introduced varieties for yield, quality and conformity to the postharvest export standards with a view of recommending them for growing by the farmers for export markets.

MATERIALS AND METHODS

The trial was planted during the long rains of 2001 at KARI-Thika. The varieties were grown in a randomised complete block design with four replications. The new varieties were R-1515, R-1516 and Lexus from Royal Sluis through Regina Seed Company, while Amy, which is already being

exported served as a local check. The plants were spaced at 50 cm x 10 cm in plots measuring 4.5 m x 3.5 m where diammonium phosphate was applied in the planting furrow at a rate of 200 kg/ha. The crop was irrigated twice per week using overhead sprinklers. The plants were topdressed with calcium ammonium nitrate at a rate of 200 kg/ha in split doses, at the first trifoliate stage and at onset of flowering. At maturity, the pods were harvested at a frequency of three times per week, counted, weighed and graded in the general beans laboratory at KARI-Thika. A 2 kg sample was later taken to the postharvest laboratory for measurement of pod length by a tape measure, pod appearance as shape and curvature, pod diameter and seed size by calipers, visual colour of pods, incidence of strings/fibres in the pod and after snapping of the pod. Where applicable, data were subjected to analysis of variance (ANOVA) using statistical application software (SAS) and means separated by the Student-Newman-Keuls (SNK) test. Pod characteristics were compared to the acceptable export standards (HCDA, undated).

RESULTS

There was a significant ($P<0.05$) difference in the number of pods among all the evaluated varieties with variety R-1516 having the highest number of pods followed by Amy, R-1515 and Lexus. There was no significant ($P>0.05$) difference in yield among the varieties, although all the introduced varieties yielded higher than the local check (Table 1). All bean varieties evaluated had acceptable green colour, pod length, diameter, appearance, seed size and fibre content for the extra fine and fine grades (Table 2).

DISCUSSION

All the varieties had a high pod load (over 30 pods per plant) which is within the acceptable range for French beans (HCDA, undated). Varietal differences in pod number per plant were significant, indicative of a higher yield potential in some of the introduced varieties, notably R-1516, which had the highest number of pods per plant. The yields of the introduced varieties were higher than the already popular commercial variety. The bulk of the yield was in the marketable category. This is beneficial because the beans are sold in weight basis and the farmers will benefit from growing the newly introduced varieties as their farms will now produce more pods. This will increase the income from their plots of land.

The varieties R-1515 and R-1516 produced more pods in the extra fine category compared to variety Lexus where most of the pods were in the fine category and thus heavier on mass per volume basis. This result explains the slightly higher yield recorded for variety Lexus despite the lower number of pods per plant.

Table 1. Yield components and yields (kg/ha) of four French bean varieties evaluated at KARI-Thika

Variety	Number of pods per plant	Marketable yield (kg/ha)
R-1515	36.4a	7195a
R-1516	42.2a	7162a
Lexus	30.6b	7432a
Amy	39.9a	5443a
CV (%)	2.8	21.7
$LSD_{0.05}$	8.8	2249

Table 2. Pod quality characteristics of introduced snap bean varieties evaluated at KARI-Thika during the short rains 2001

Variety	Grade	Colour	Length (cm)	Diameter (cm)	Curvature	Strings (fibres)	Seed size (mm)
R-1516	Extra fine	Green	10	0.3	Straight	absent	Seedless
	Fine	Green	14	0.5	Straight	absent	<4 mm
	Bobby	Green	15	0.6	Straight	absent	<6 mm
R-1515	Extra fine	Green	10	0.3	Straight	absent	Seedless
	Fine	Green	12	0.6	A bit curved	absent	<6 mm
	Bobby	Green	16	0.7	A bit curved	absent	<13 mm
Lexus	Extra fine	Green	10	0.3	Straight	absent	Seedless
	Fine	Green	12	0.6	Straight	absent	<7 mm
	Bobby	Green	14	0.7	Straight	present	<14 mm

Sales to the market are determined by client demand which may specify the grade category required. Farmers then schedule harvesting frequency accordingly to arrive at the required ratios of extra fine to fine pods. Varieties vary in potential to produce extra fine and fine beans (Ndegwa et al. 1999; Regina seed, 2000). Pod characteristics of the introduced varieties evaluated conform to the export standards.

CONCLUSION AND RECOMMENDATION

All the introduced snap bean varieties had quality characteristics conforming to the export standards. They are therefore recommended for export markets and for growing in Kenya.

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