



‘Rapoza’ A Potential Mango Cultivar for the Americas

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‘Rapoza’ is a large, high-quality mango cultivar (*Mangifera indica* L.) selected by Dick Hamilton of the University of Hawaii in the 1970s. A progeny of ‘Irwin’, it produces large, attractive, and excellent quality large red fruits weighing 600–800 g with desirable characteristics for a commercial mango. It is generally late bearing under South Florida conditions, where the fruit matures over a long period, (late July to October). It has good flavor, excellent disease resistance and good appearance. Trees are vigorous and productive with a rounded canopy. ‘Rapoza’ has gained attention in the past decade as a red mango alternative in the Americas with particular interest in Peru. ‘Rapoza’ was introduced to Peru in 2010 and trees have been evaluated in different regions of the Sechura desert, located south of Piura, Peru. It bears regularly and sets well. Preliminary data of the performance of ‘Rapoza’ under Sechura desert conditions is provided, including phenological stages of orchards and yield.

Growing, producing, and marketing the right mango cultivar or cultivars has a critical impact on establishing, maintaining, and expanding the fresh fruit business in the western hemisphere. Although the mango trade is still dominated by the major cultivars ‘Tommy Atkins’, ‘Keitt’, ‘Kent’, ‘Haden’ yet they all have their issues. Currently, new orchards of ‘Tommy Atkins’ are increasing, but the mango industry has expressed the need for new alternatives. The establishment and development of new cultivars can be a difficult task. There are questions that must be resolved. Answers about production, postharvest handling, transport, and marketing considerations are just some areas that require evaluation if new mango cultivars are to be introduced successfully.

There has been some effort from the private sector in Peru, where novelty mango cultivars have been introduced over the past decade. The objective is to review a range of potential cultivars that have the attributes necessary for export. The purpose of this report is to offer preliminary results of the cultivar ‘Rapoza’ growing in different regions of the Sechura desert, south of Piura, Peru.

Peru is currently the main source of mango imports into the United States which accounts for about 43% of their production. The total amount of fresh mangos in 2019 was 204,000 tons with 90% of being ‘Kent’ reported by Produce Blue Book (2020).

The mango production in Peru is concentrated in the northern coastal valleys, principally in the areas of Olmos, Motupe in Lambayeque, the valley of San Lorenzo, Chulucanas, Tambogrande and Sullana in Piura, Casma and Ancash. They are all have a dry tropical climate that allows mangos to be grown with few problems from fungal diseases.

‘Rapoza’ is also commercially produced in South Florida on a small scale, where trees are well adapted to the humid conditions of the region.

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Origin

‘Rapoza’ was selected from an open-pollination population of ‘Irwin’ seedlings grown at the Poamoho Research Station, Oahu County, Hawaii. The original selection was made in 1985, and the selected tree was designated FR6T6 Scions were distributed to growers in Hawaii and propagated in South Florida. The tree was introduced to South Florida in the past decade by Franky Sekiya Nursery, Hawaii. Today about 1000 trees are grown for the local market in South Florida.

TREE DESCRIPTION. Fig.1 shows the tree with a round canopy. Trees in South Florida reach a height of 10–15 ft with a spread of 8 ft, but they can be kept smaller with annual pruning. The tree flushes twice a year, with moderate vigor than can be controlled with proper pruning. Trees are mechanically pruned, as well as by hand.

FLOWERS. The flowers are produced on terminal inflorescences with thousands of individual flowers that typically set less than 1.4% with natural pollination. Flowers of ‘Rapoza’ are shown



Fig. 1. ‘Rapoza’ tree.

in Fig. 2. They have a high percentage of hermaphrodite flowers (50% to 70%) compared with other cultivars, under South Florida conditions (Ledesma, et al. 2018). Male flowers are a pale cream color with yellow in the center while the hermaphrodite flowers are pink. Flowers have good tolerance to anthracnose (*Colletotricum gloeosporioides*) and moderate susceptibility to powdery mildew (*Oidium mangiferae*).

FRUIT. The tree produces large fruits weighing 600–800 g, with a rounded ovate shape and a moderate flattened base with small lateral beak (Fig. 3). The fruit has a slightly undulating finish with an intense dark-red blush that covers almost the entire surface with a natural wax. The fruit is firm, with a soft texture and few yellow lenticels. The flesh has a tangerine orange color and is firm and melting, with almost no fiber. The flavor of ‘Rapoza’ has been recognized as an appealing flavor for South Florida residents (Ledesma, et al. 2019). The fruit has a pleasant cantaloupe aroma, with an enjoyable sweet taste with hints of



Fig. 2. ‘Rapoza’ flowers.



Fig. 3. ‘Rapoza’ fruit.

orange peel, spondias, honey, and other citrus. °Brix falls between 19–21, with excellent eating quality. It is a polyembryonic cultivar. The seed is 3.9 in long, 2.3 in. wide, and 1.6 in. thick.

HARVEST AND POSTHARVEST. In South Florida there are few commercial orchards of ‘Rapoza’ destined for local market. The fruit has fair to good anthracnose tolerance and low incidence of internal breakdown issues. Sap burn is not a problem. The fruit is late season, between August to October. Local farmers harvest by hand at 70% to 80% maturity stage for the ripe market. The fruit is sold online or at roadside markets. Trees are easy to handle and highly productive, with an average yield of 50 kilos per tree for five-year-old trees under South Florida conditions.

Trial Status in Peru

LOCATION. ‘Rapoza’ was introduced to Peru in 2010 and trees have been evaluated in different regions (Piura and Lambayeque) of the Sechura Desert. ‘Rapoza’ trees were evaluated for five years.

ENVIRONMENTAL CONDITIONS. The Sechura Desert is a coastal desert located south of the Piura Region of Peru along the Pacific coast and inland to the foothills of the Andes. Its extreme aridity is caused by the upwelling of cold coastal waters and subtropical atmospheric subsidence, but it is also subject to occasional flooding during El Niño years.

In the Sechura, the summers are short, oppressively hot, and mostly cloudy; the winters are long, comfortable, windy, and mostly clear. It is dry year-round. Over the course of the year, the temperature typically varies from 62 °F to 87 °F and is rarely below 59 °F or above 90 °F. “The Sechura desert has mostly sandy soils, but there are also soils formed by remains of gastropod and bivalve shells, as well as rock; the latter formed by the ‘Illescas massif’, which is a remnant of the western Andes in middle of the desert.” (Galves, et al 2006).

‘Kent’ is Peru’s most important commercial cultivar grown for export. It is a red skinned variety weighing between 600 and 750 g, which was selected in Florida in 1932. The ‘Kent’ produced in Peru has an attractive color and excellent quality. It has captivated the international market and has managed to position the Peruvian mango as one with a high reputation. Normally the ‘Kent’ variety has some red flush, however in other climates it retains a green color even when it is completely ripe.

‘Kent’ is a mango with high quality and flavor. The tree has a manageable size. It has good economic performance, and excellent quality. ‘Kent’ is versatile, valuable in the industry as fresh, frozen, and dehydrated fruit as well as for juice and pulp. ‘Kent’ is imported into the United States mainly from central and northern Mexico and from Peru. However, the main disadvantage of ‘Kent’ is its lack of adaptability to humid tropical climates, where it has poor flowering and low economic yields

Peru reports an increase in new orchards in the Piura region with ‘Kent’ variety where both small and large producers are investing. It is estimated that in the last three years they have gone from 32,000 ha to 34,000 ha of mango destined for export. Peru continues to have new plantings of ‘Kent’, but producers are looking for variety alternatives with characteristics similar to ‘Kent’ in quality and color and more adaptability to climate change and perhaps more tropical.

TRIAL SPECIFICATIONS. The orchard consists of 1.5 acres. The planting for the current study compared ‘Rapoza’ with ‘Kent’. The trees were planted a spacing of 7 m between the rows and

Table 1. Average yield ‘Rapoza’ vs ‘Kent’.

Cultivar	Yield per tree (kg)		
	Year 3	Year 4	Year 5
Rapoza	25	28	62
Kent	15	25	38

1 m within the row. Trees have been hand pruned every year for the first three years to develop good tree architecture. The trees flowered and bore fruit three years after planting.

Both ‘Rapoza’ and ‘Kent’ were grafted on ‘Chulucana’ rootstock; one-year-old grafted trees were planted in the field.

For management, the trees were irrigated an average of 10 liter per tree per day for the first year and up to 50 liters per tree/day by year five. ‘Rapoza’ trees were treated with the same protocols for commercial mango production in the region with ‘Kent’.

No bloom induction has been used during the evaluation period. ‘Rapoza’ mangos were evaluated as they compared with ‘Kent’.

Phenological Observations

PRUNING AND NEW GROWTH RATE. Pruning is done in Piura in April (week 15). Observations showed that ‘Rapoza’ took 90 days to regenerate new growth, mature and start blooming. ‘Kent’ took longer, about 112 days.

BLOOMING. Blooming starts at almost the same time as ‘Kent’, in September (week 37). Panicle formation takes few days longer in ‘Kent’ compared with ‘Rapoza’. Preliminary observations show that ‘Rapoza’ does not need low temperatures to bloom unlike ‘Kent’. Young ‘Rapoza’ trees start blooming early when trees were one year old so blossoms had to be removed to allow better growth.

FRUIT SET. From flower to fruit set, ‘Rapoza’ takes an average of 49 days, compared with ‘Kent’ which takes an average of 42 days.

YIELD. Trees start producing three years after planting. The three-year evaluation recorded phenological stages from Feb. 2019 to Apr. 2021 (Table 1). The number of fruits per tree was recorded, finding a maximum fruit weight of 600 g.

SUNBURN SENSITIVITY. One of the regular activities in commercial orchards of ‘Kent’ is sunburn protection. With temperatures increasing, farmers raised the issue of sun protection for fruit. Current options include everything from spray-on sun protection products to shade netting, to overhead misting and sprinkler systems to bring orchard temperatures down. Preliminary observations show that ‘Rapoza’ fruit had minimal sunburn compared with ‘Kent’.

COLOR DEVELOPMENT. ‘Kent’ usually turns a greenish-yellow color with some red blush as it matures. Color development is often achieved by allowing light into shaded parts of trees to enhance blush development, but this must be done carefully to avoid sudden exposure of fruit to direct sunlight. Even a relatively short period of exposure to intense direct sunlight could cause significant damage especially in ‘Kent’. ‘Rapoza’ is showing better color, and its red skin seems to be covering up to 90% of the surface of the fruit.

Conclusions and Recommendations

Results were significant for both appearance and yield. Yield parameters were highest in ‘Rapoza’ with an average of 25 kg per tree by the first year of production compared with ‘Kent’ with 15 kg per tree. The yield rate continued same pattern for the following two years of evaluation with 62 kg per tree for ‘Rapoza’ and 38 kg per tree for ‘Kent’ by year five.

Spacing 7 m between rows and 1 m between trees must be evaluated further. Using regular pruning has shown good results through the end of this trial, however this information must be reviewed using the same parameters as the trees get older. Color is an important criteria for commercial purposes. Preliminary observations show that ‘Rapoza’ has better color than ‘Kent’ under similar conditions. ‘Rapoza’ fruit has good color even inside the canopy, and fruits exposed to the sun are less sensitive to sunburn. Sunburn is a serious problem in the Peruvian Sechura Desert. It requires additional management expenses. Having a cultivar which is less sensitive to sunburn is advantageous. ‘Rapoza’ has a natural red color flush and a higher percentage of red skin compared with ‘Kent’. Further analysis of these data have to be evaluated for further recommendations.

We recommend continuing this trial for at least three more years. Future trials are recommended using different spacings and observing yield per tree, vegetative variables, and reproductive variables that can be affected by planting density. Further analysis of harvest and postharvest procedure are necessary using a wide range of descriptors both qualitative and quantitative, including characteristics of the tree and the fruit.

The adaptations of a variety to environmental pressures such as drought, wet weather during flowering, temperature, pests, and diseases are also important selection criteria, because they determine the consistency of the crop and fruit quality. Future analysis should include the management activities applied to the orchards and the response on growth.

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