



## Assessing Yield and Curcuminoid Content for 6 Varieties of Turmeric (*Curcuma longa*) Grown on Kaua‘i

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Turmeric (*Curcuma longa*) and related *Curcuma* species have been used traditionally in India, China, Hawai‘i, and other cultures for millennia. Today they are used around the world for food, spice, medicine, dye, and religious purposes. Recent biomedical studies have corroborated the long-known traditional medicinal values of turmeric and its constituent curcuminoid compounds, which have anti-inflammatory, antioxidant, and anticarcinogenic properties. In addition to crop yield, curcuminoid content is also an important market factor because of the desirability of turmeric for medicinal use. In Hawai‘i, there is resurgent interest in growing turmeric to meet rising demand for both local and export markets. In 2018, turmeric was the second highest value specialty crop in the state after bananas on their “Hawaii Tropical Fruit and Crop Report” (NASS 2020).



Figure 1: Trial in the field mid-season, Wailua, Kaua‘i.

As part of statewide research and extension efforts to support an expanding turmeric industry, we examined yield and curcuminoid content of six varieties of *C. longa* grown on the windward side of the island of Kaua‘i.

### Methods

This field trial was conducted at the University of Hawai‘i, Kaua‘i Agricultural Research and Extension Station, in Wailua, Kaua‘i County. The elevation is approximately 530 ft and average annual rainfall is 98 in. The trial was planted in June 2019 and harvested 8 months later in February 2020 when the majority of the plants had fully senesced. The planting was done in a randomized complete block design with four replications and 5 plants per plot. Plants were spaced 1 ft apart in the row with 5 ft between rows. Organic slow-release fertilizer was applied prior to planting, and no pesticides were used in this trial. Planting, weeding, and harvesting were all done by hand.

Curcuminoid analysis of the different varieties was conducted using high-performance liquid chromatography conducted by the Bingham Lab, Molecular Biosciences and Bioengineering, CTAHR, UH-Manoa. Each variety was analyzed for curcumin, demethoxycurcumin, and bisdemethoxycurcumin—three of the best-studied medicinal compounds of interest.

## Results and Discussion

Marketable rhizome yield ranged from 0.38 - 1.66 kg per plant, equivalent to 8.2 – 35.7 tons/ha at the plant spacing used in this trial. Reported commercial yields range widely from 13-35 tons/ha internationally. Variation is likely due to differences in production systems, including plant density, availability of irrigation, intensity of cultivation, etc.

Significant differences ( $p < 0.05$ ) in average yields were observed between certain varieties, with 'Roma', 'Olena', and 'Hawaiian Red' yielding the highest (average 1.11 - 1.25 kg/plant), while 'BKK' and 'Wailua Gold' yielded the lowest (average 0.52 - 0.70 kg/plant).

## Turmeric Rhizomes Marketable Yield

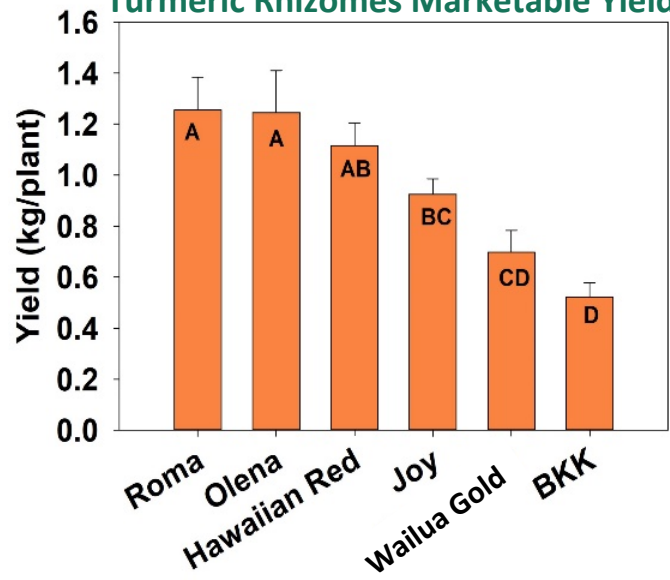
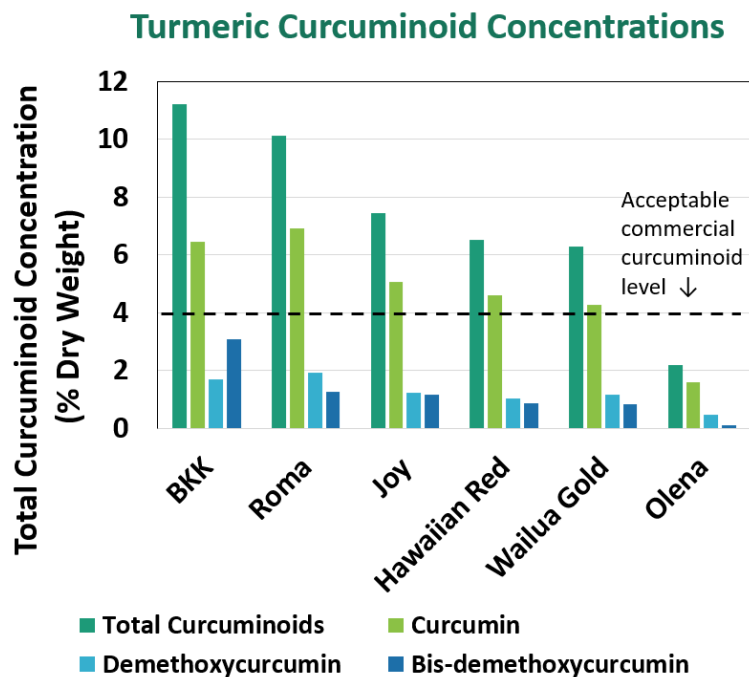


Figure 2. Marketable rhizome yield per plant (kg) of six turmeric varieties. Error bars represent standard error of the mean. Bars marked with the same letter are not significantly different.



The total curcuminoid concentrations (dry weight basis) for these varieties ranged from 2.2% in ‘Olena’ to 11.2% in ‘BKK’, with the novel variety ‘Wailua Gold’ and industry standard ‘Hawaiian Red’ measured at 6.3% and 6.5%, respectively. All varieties except ‘Olena’ exceeded the acceptable commercial curcuminoid threshold of 4%. The recently introduced ‘Roma’ is of particular interest for being high yielding and high in curcuminoids (10.1%). No statistics were possible because samples were not replicated.



For comparison of these results to the two different trial sites on Maui with very different climate conditions, see “Yield and Quality of Turmeric on Maui” ([link](#)) in this edition of the Hanai ‘Ai for full details on the that study.

These findings are useful to help Hawai‘i turmeric growers to select varieties with the best balance of characteristics to meet specific market demands. Through outreach events, planting material was distributed to both commercial growers and home gardeners.

**Figure 3:** Curcuminoid concentrations of each turmeric variety (percent dry weight). The dotted line shows the acceptable commercial curcuminoid level of 4%. Note that all varieties except ‘Olena’ from this trial greatly exceed this threshold.

**References:**

National Agricultural Statistics Survey (NASS). US Department of Agriculture. 2020. Hawaii Tropical Fruit and Crops Report. [https://www.nass.usda.gov/Statistics\\_by\\_State/Hawaii/Publications/Sugarcane\\_and\\_Specialty\\_Crops/Tropical/202002tropicalspecialtiesHI.pdf](https://www.nass.usda.gov/Statistics_by_State/Hawaii/Publications/Sugarcane_and_Specialty_Crops/Tropical/202002tropicalspecialtiesHI.pdf)

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