

Classification of Hawaiian Avocado Cultivars According to Flower Types¹

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Abstract. Seventeen of 47 avocado cultivars grown in Hawaii were classified as class A and 30 as class B flowering types.

Anthesis of flowers in avocado, *Persea americana* (Miller), is considered synchronous protogynous dichogamy as first described by Nirody (5) and detailed by Stout (8). Functional sex type of the flowers is highly precise. The flower is morphologically perfect but is functionally female or male, depending upon the time of the day. Nirody recognized 2 distinctly different types of flowering habits in avocado and Stout classified them as types A and B. Flowers of type A cultivars open in the morning with receptive pistil but no pollen is shed. The flowers close at noon and reopen for the second time in the afternoon of the following day to discharge the pollen. Flowers of type B cultivars close in the evening, reopen the following morning and releases pollen. Many studies have been made on this phenomenon and cultivars have been classified in either of the two types (1, 2).

This particular behavior is important to certain commercial avocado orchards to insure good production as cross-pollination between types is an enforced requirement (3, 6, 9). Many different cultivars are grown in Hawaii, so it is essential to determine their flower types in order to establish productive orchards. Our growers feel strongly that pollination is a productivity factor in some of our high quality, low bearing cultivars.

Forty-seven avocado cultivars, most of which grafted on rootstocks of both Guatemalan and West Indian races, were used. There were 2 trees of each cultivar ranging in ages from 10-16 years. Flowering behavior of these trees was studied for several days during 2 consecutive flowering seasons starting in 1978. Several flowers from each tree were carefully examined and the functional sex of the flowers at that time of the day was determined. The flowering mechanism of the avocado cultivars grown in Hawaii seems to follow the synchronous protogynous dichogamy pattern and the 47 cultivars studied were grouped into the 2 classes (Tables 1, 2). Flowering behavior from day to day and

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even between years under our weather conditions was very precise.

Table 1. Time of opening and closing of pistillate and staminate stages of class A cultivars^z.

Cultivar	First day (Pistillate stage)		Second day (Staminate stage ^y)	
	Opening	Closing	Opening	Closing
Alboyce	8:15 AM	1:15 PM	2:15 PM	—
Ashikawa	9:00 AM	12:00 PM	1:40 PM	—
Beardslee	9:40 AM	1:00 PM	1:00 PM	—
Butler	10:00 AM	2:30 PM	1:30 PM	—
CRC 14-11	9:45 AM	3:00 PM	2:15 PM	—
CRC 151-2	8:15 AM	1:15 PM	12:15 PM	—
Guatemala	10:15 AM	1:45 PM	12:45 PM	—
Hal R28 T18	8:30 AM	1:00 PM	11:45 AM	—
Hass	8:00 AM	11:45 AM	11:00 AM	—
Hayes (7315)	7:15 AM	12:30 PM	11:45 AM	—
Hulumanu	10:15 AM	2:00 PM	2:00 PM	—
Ijialu	8:30 AM	1:00 PM	1:00 PM	—
Kashlan	8:30 AM	12:15 PM	12:00 PM	—
Rincon	7:15 AM	1:15 PM	11:00 AM	—
Rodrigues	7:30 AM	12:00 PM	12:15 PM	—
Sato T-53	10:30 AM	2:00 PM	2:00 PM	—
Semil 34	9:15 AM	1:00 PM	11:45 AM	—

^zTimes are rounded off to the nearest 15 min.

^yFlowers checked after 5:00 PM were still open but assumed they close at night.

Table 2. Time of opening and closing of pistillate and staminate stages of class B cultivars^z.

Cultivar	First day (Pistillate stage ^y)		Second day (Staminate stage)	
	Opening	Closing	Opening	Closing
Case	2:45 PM	—	7:00 AM	2:00 PM
Chang	2:00 PM	—	7:00 AM	2:00 PM
Coban	2:00 PM	—	7:00 AM	2:00 PM
Esparta	3:45 PM	—	8:30 AM	3:00 PM
Ezaki	2:45 PM	—	6:45 AM	1:45 PM
Frowe	3:15 PM	—	7:00 AM	2:00 PM
Fuerte	2:45 PM	—	6:45 AM	2:45 PM
Fujikawa	2:15 PM	—	7:00 AM	1:00 PM
Gripina 12	3:15 PM	—	7:00 AM	2:00 PM
Hashimoto	2:15 PM	—	7:15 AM	1:15 PM
Hal R4 T41	3:45 PM	—	7:15 AM	2:45 PM
Hal R27 T40	1:45 PM	—	7:00 AM	1:45 PM
Itzamna	1:00 PM	—	7:00 AM	1:00 PM
Kahaluu	3:00 PM	—	7:00 AM	1:45 PM
Kampong	4:00 PM	—	6:45 AM	2:15 PM
Mal 2-1	2:45 PM	—	6:45 AM	1:45 PM
Masutomi	4:30 PM	—	8:30 AM	1:20 PM
Monge	4:30 PM	—	7:30 AM	2:00 PM
Murashige	1:45 PM	—	6:45 AM	1:45 PM
N-119	2:30 PM	—	7:30 AM	1:15 PM
Nabal	2:30 PM	—	7:15 AM	1:15 PM
Nena	3:30 PM	—	7:15 AM	2:15 PM
Nishikawa	2:45 PM	—	7:15 AM	2:45 PM
Pankay	2:15 PM	—	7:15 AM	1:15 PM
Ruehle	5:00 PM	—	7:30 AM	2:30 PM
Semil 47	3:30 PM	—	7:15 AM	2:15 PM
Sharwil	2:45 PM	—	7:00 AM	2:00 PM
Tanaka	2:30 PM	—	7:00 AM	1:15 PM
Wahiawa	1:15 PM	—	7:00 AM	1:15 PM
743-77	2:30 PM	—	8:15 AM	2:00 PM

^zTimes are rounded off to the nearest 15 minutes

^yFlowers checked after 5:00 PM were still open but assumed they close at night.

Observations also reiterated the possibility of some self-pollination to take place inasmuch as some flowers were still functioning as pistillate flowers, while other flowers a day old were functioning as staminate flowers. It was noticed that the honey bee (*Apis*

mellifera L.) activity increased with the functioning of the pistillate flowers and decreased well before the flowers closed. Likewise the honey bee activity remained low until much pollen is shed.

In view of the exact nature of the flowering behavior of avocados, there were discrepancies in both 'Nabal' and 'Ruehle' when compared with classification made elsewhere (6). This may be due to wrong identification of the cultivar in the orchard. Flower types of other cultivars such as 'Fuerte', 'Hass' and 'Itzama' agree with classifications made in California and Florida.

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