Flowering and fruiting pattern in various ecotypes of the neotropical oilseed palm *Acrocomia*

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Background

The oilseed palm species *Acrocomia* are endemic to Central and South America. They are considered sustainable alternatives to the African oil palm, allowing to expand the commercial growing areas of oilseed palms into semi-arid regions in the Tropics and Subtropics.

Flowering in Acrocomia co-occurs with the first half of the rainy season. It was suggested that the onset of flowering is triggered by the first rains (Scariot et al., 1991) The inflorescences of Acrocomia are panicles with several hundred rachillae bearing female and male flowers. The maturation of the fruits takes 12-14 months.

According to Scariot et al. (1995), the time of flowering is crucial for the female reproductive success in Acrocomia and not the abundance of female flowers. The reason is the magnitude of synchronous flowering of the plants as Acrocomia is protogynous and cross-pollination is predominant.

Acrocomia Plantation in Araponga, MG, Brazil

The long time of maturation of the fruits results in Acrocomia palms bearing open inflorescences and infructences at the same time

Inflorescence from the actual season

Infructence from the previous season

Research Aim and Questions

The aim was to assess differences in flowering time , fruit set and yield in Acrocomia ecotypes from different regions of Brazil.

The research questions were:

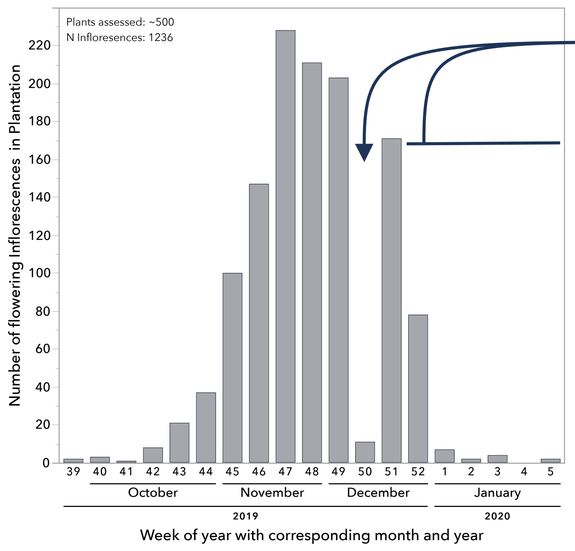
1. How are Acrocomia ecotypes originating from different regions varying in their flowering pattern?
2. What is the fruit set throughout the flowering season?
3. How are the yield (number of fruits) and fruit set differing between the various ecotypes?

Conclusion

- Ecotypes show differences in flowering onset, peak and duration
  - Important to consider when planning plantations
    - ➤ Combination ecotypes and growing regions
  - Longer flowering periods could compensate for losses due to poor weather conditions
    - ➤ Further investigation needed
- Decrease of fruit set during the flowering peak ➤ Synchronicity of flowering not sole effect ➤ Impact of abiotic factors like humidity ➤ Further investigation is needed
- Despite low Fruit set ➤ Most infructences show a moderate to good yield formation comparable or above to other studies (Farias, 2010; Motoike et al., 2013; Valim, 2015)
  - ➤ High numbers of female flowers not developing into fruits ➤ Mechanism for selection of superior progeny without decreasing fruit production ➤ Further investigation needed

Results and Discussion

Progress of Flowering in Plantation



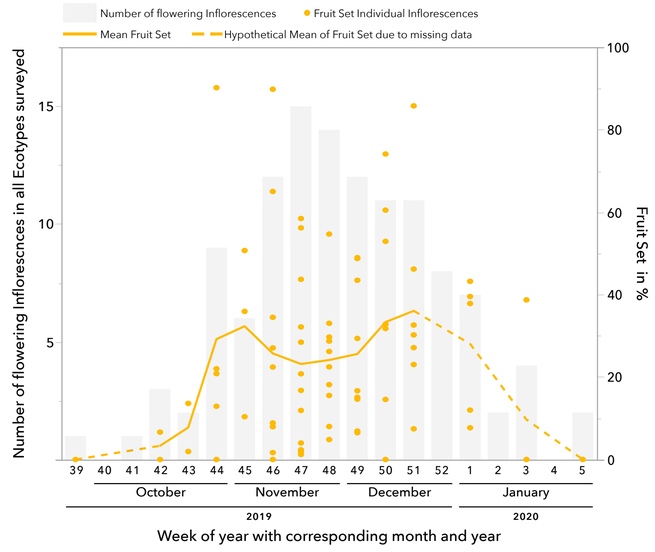
Flowering Peak

- Observation: Second half of November
- Literature: October
  - ➤ shift in flowering season
- Potential reasons:
  - Late onset of rainy season in 2019
  - Previous studies performed in different climatic regions of Brazil

Progress of Flowering in surveyed Ecotypes

- Differences in flowering onset and time interval
- Ecotypes with clear peaks and compact flowering time interval
  v.s.
  Ecotypes with extended flowering time intervals and no clear peaks

Fruit Set in cohesion with Time of Flowering in surveyed Ecotypes



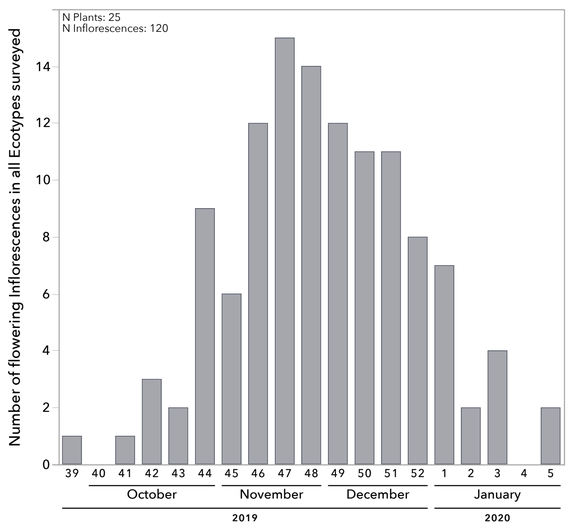
Fruit Set over time

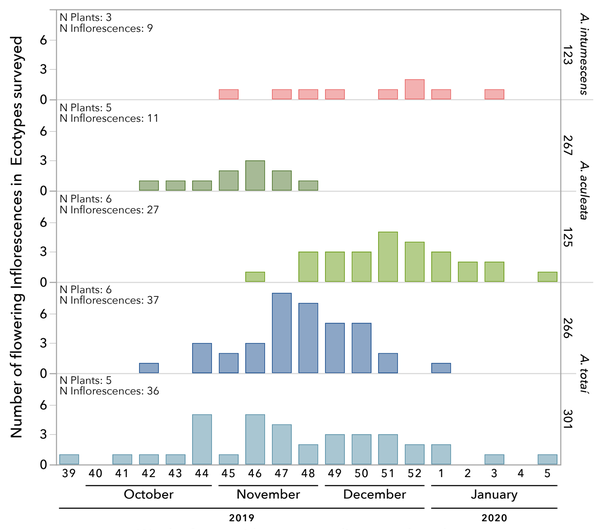
- Observations:
  - Overall November/December highest fruit set (data not shown)
  - Decrease of mean fruit set in November despite peak of flowering
- Literature:
  Highest fruit set at flowering peak
- Potential reasons:
  - Fruit set impacted by abiotic factors ➤ heavy rainfalls in November
    - ▶ Higher fall of immature fruit
    - ▶ Higher number of non-viable female flowers
      - ➤ Aborted at inflorescence opening
  - Reduced number/movement of pollinators due to weather conditions ➤ Pollination limitation

Fruit Set and Yield

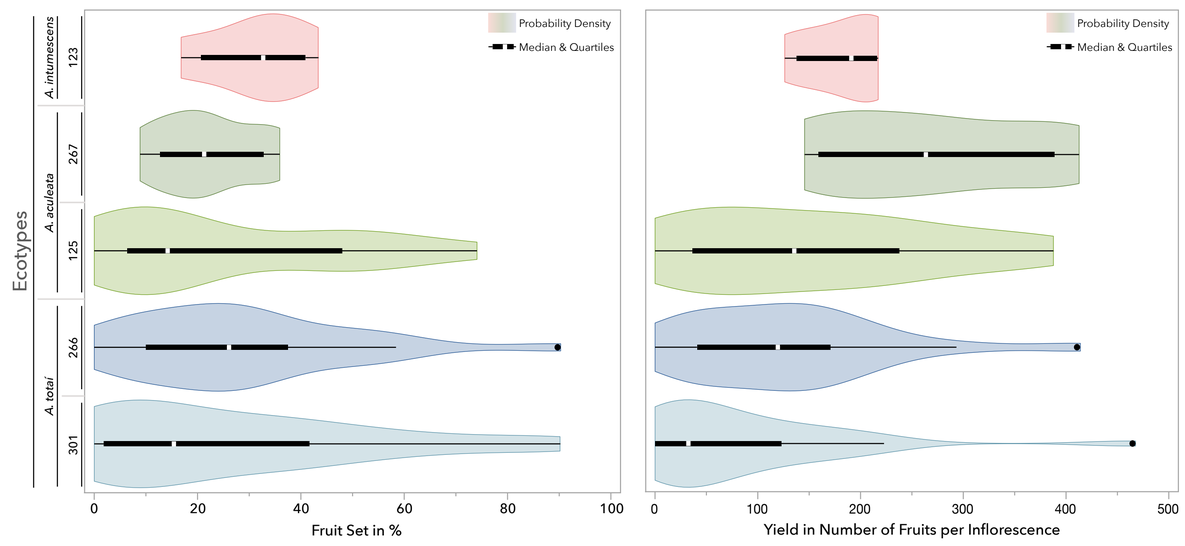
- Low fruit set in all ecotypes ➤ 86% of infructences < 50%
- 26% of infructences were aborted (Fruit set of 0%)
- Ecotypical differences present especially in variability between different infructences

Progress of Flowering in surveyed Ecotypes



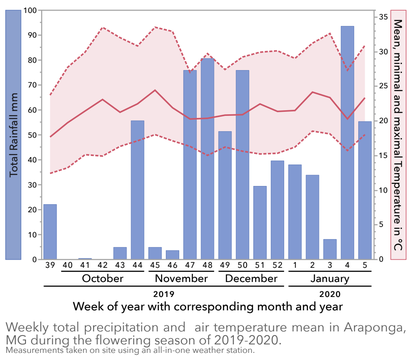


Fruit Set and Yield in surveyed Ecotypes



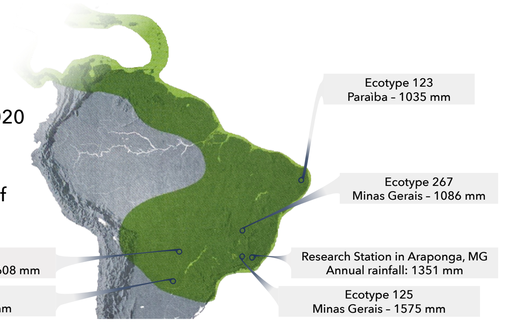
Materials and Methods

- Study Site: Acrocomia Active Germplasm Bank in Araponga, MG, Brazil
  Managed by the Universidade Federal de Viçosa



Weekly total precipitation and air temperature mean in Araponga, MG during the flowering season of 2019-2020.
Measurements taken on site using an all-in-one weather station.

- Study Object: 5 Ecotypes of Acrocomia from different climatic regions of Brazil and Paraguay
- Survey of flowering inflorescences from September 2019 to January 2020:
  - Total plantation: Counting of newly open inflorescence once per week
  - Surveyed ecotypes: Counting and labelling of newly open inflorescences every second day
- Assessment of fruit set and yield
  - Fixing of bags around infructences in late 2020 to collect falling fruits
  - March 2021: Harvest of infructences
  - Counting of fruits, rachillae and estimation of female flowers through the scar counting



Map of the distribution of the species *Acrocomia* and the locations of origin of the studied ecotypes. The annual rainfall is indicated for each region of origin and the research station (Municipality level).
Rainfall data by Alvares et al. (2013) and the Instituto de Pesquisas e Estudos Florestais, Brazil. | Map adapted from Dransfield et al. (2008)

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