

See discussions, stats, and author profiles for this publication at: <https://www.researchgate.net/publication/324585805>

Performance of the Second Generation Ambakelle Special Coconut Variety Under Varying Rainfall and Temperature Conditions

Conference Paper · January 2018

CITATIONS

2

READS

108

4 authors:



[Ruwan Kumara Samarasinghe](#)

Coconut Research Institute of Sri Lanka

17 PUBLICATIONS 37 CITATIONS

SEE PROFILE



[Muditha K. Meegahakumbura](#)

Uva Wellassa University

69 PUBLICATIONS 530 CITATIONS

SEE PROFILE



[Auchithya Chaturani Dissanayaka](#)

Coconut Research Institute of Sri Lanka

27 PUBLICATIONS 114 CITATIONS

SEE PROFILE



[Lalith Perera](#)

Coconut Research Institute of Sri Lanka

77 PUBLICATIONS 1,079 CITATIONS

SEE PROFILE

PERFORMANCE OF THE SECOND GENERATION AMBAKELLE SPECIAL COCONUT VARIETY UNDER VARYING RAINFALL AND TEMPERATURE CONDITIONS

C.R.K. Samarasinghe, M.K. Meegahakumbura*, H.D.M.A.C. Dissanayaka and L. Perera

Genetics and Plant Breeding Division, Coconut Research Institute, Lunuwila, Sri Lanka

**Corresponding author (email: mkmeegahakumbura@gmail.com)*

Introduction

Coconut is the most extensively grown and used palm species in the world. It is a major plantation crop in Sri Lanka that contributes 0.7% to the GDP and 9.86% to the agriculture GNP (Central Bank of Sri Lanka, 2016). Coconut plays a significant role in socio-economic life of Sri Lankans as a livelihood crop. During recent past coconut industry of Sri Lanka suffered heavily from long and unpredictable droughts occurred as a result of global climate change. Drought and excessive heat reduce nut yield by reducing nut setting and increasing immature nut fall. It has been estimated that there is a 2/3rd of annual yield loss caused by drought and excessive heat. (Coconut Cultivation Board of Sri Lanka, 2013). Moreover, none of the coconut cultivars used today gives stable yields under drought and excessive heat creating a crisis in the coconut industry. Therefore, development of cultivars giving stable yields even under drought conditions is the most sustainable solution to mitigate the effect of changing environment. Selection of genotypes giving stable yields over the years is the essential first step in developing drought tolerant coconut cultivars.

Isolated Seed Garden (ISG) Ambakelle, Coconut Research Institute has the most extensively selected and largest tall coconut population in Sri Lanka. A study had been carried out at field no 01 and 02 of Isolated Seed Garden (ISG) Ambakelle using 16 years (1966-1982) of individual pick wise yield data to select palms showing a stable and moderately higher yields even under adverse climatic conditions. In this study 84 palms have been selected by using Finlay and Wilkinson method and the selected palms have been named as Ambakelle Special palms (AS) (Wickramaratne 1987). The seednuts obtained from Ambakelle Special mother palms are issued as AS while the seednuts obtained from the unselected palms at ISG are issued as CRIC60 which is the most extensively cultivated coconut cultivar in Sri Lanka. In 1992 a second generation of AS palms have been developed by paired crossing and have been planted at the field no. 11A of ISG with CRIC60 as the control. The present study was conducted to compare the performance of this second generation of AS palms under changing climatic conditions from January 2014 to December 2016 based on pick wise yield data.

Materials and Methods:

Hundred and fifty palms from AS and CRIC60 at field no 11 of ISG Ambakelle, Arachchikattuwa were selected for the study. This site belongs to the agri-ecological zone Low country Intermediate Zone (IL3), (Punyawardena, 2008). The central coordinates of the location is 7° 41'27.31" N and 79° 53' 48.31" E and the average elevation is approximately 35 m above the mean sea level. The soil in the site is favorable for coconuts and belongs to Ambakelle soil series within the major soil group Alluvial (Mapa, 2010).

Bimonthly nut yield (pick) data were collected from the selected palms for the duration of January 2014 to December 2016. Data were analysed by General Linear Model (GLM) procedure and mean separation was done through Dunacan Multiple Range Test by using SAS 9.1.3 portable version. Descriptive statistics and matrix plot graph were obtained by using MINITAB 17 software.

Results and discussion:

The mean annual nut yield of AS during 2014-2016 was 109 nuts/palm while the mean annual nut yield of CRIC was 90nuts/palm and this difference was statistically significant. Furthermore, a significant year to year variation was observed with respect to nut yield. However, the interaction of cultivar x year was not significant (Table 01).

When considering the stable yielding character under varying rainfall and temperature conditions (Figure 01), the first quartile value (Q1) of annual nut yields of AS was 82nuts/palm compared to 59nuts/palm in CRIC60 revealing lesser variation of nut yields among AS palms. Moreover, the Coefficient of Variance (CV) of AS was lower compared to CRIC60 with respect to both annual per palm yield and pick-wise per palm yield revealing higher yield stability of AS compared to CRIC60 (Table 01).

Figure 1: Total monthly rainfall and mean maximum monthly temperature in ISG Ambakelle from January-2014 to December-2016.

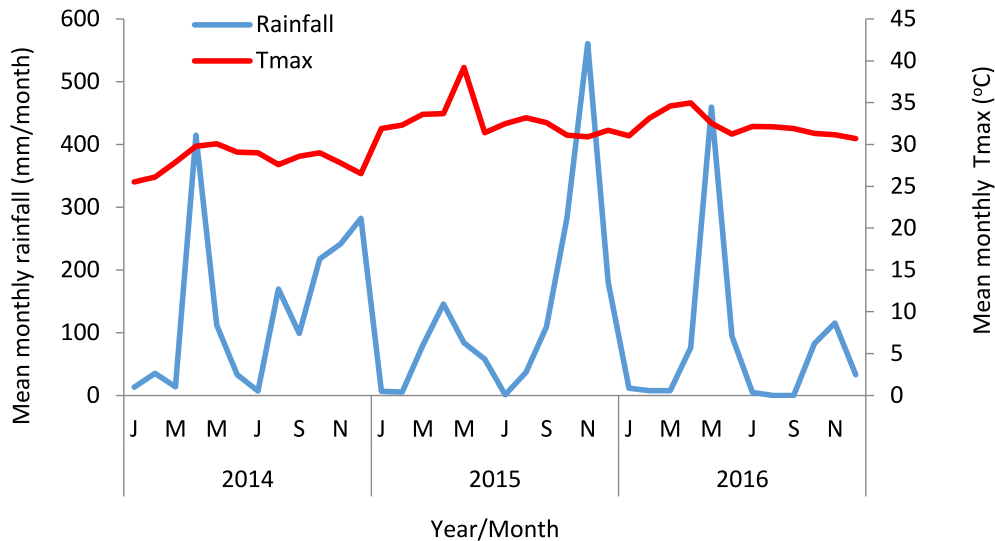


Table 01: Mean nut yield per year and per pick yield and related descriptive statistic values of two different coconut cultivars in ISG from 2014 to 2016.

Parameters	CRIC60	Ambakelle Special
Mean yield (nuts/Year)	90.4±2.1 ^b	108.8±2.1 ^a
Coefficient of Variance (CV)	48.81	39.82
Q1	59.00	82.00
Q3	122.00	135.75
Mean yield (nuts/pick)	13.56 ^b	16.33 ^a
Coefficient of Variance (CV)	103.79	83.85
Q1	0	6.0
Q3	22	24

Two matrix plots were drawn using CV and mean yield as X and Y variables respectively. When 100% of CV was considered as the reference, over 80% palms of AS population showed a lower CV than reference (Figure 02) while only 50% of CRIC60 palms showed a lower CV than reference (figure 03) revealing high yield stability of AS over CRIC60. AS Palms that showed higher mean pick-wise yield and lower CV can be used as parent palms (in future coconut breeding programmes).

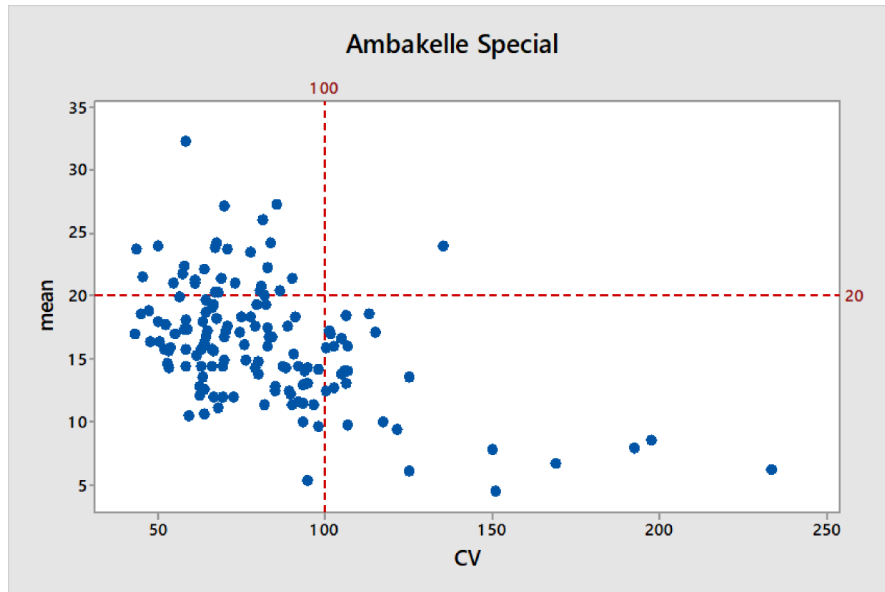


Figure 01: Visualization of mean yield/pick of selected 2nd generation AS palms with CV value

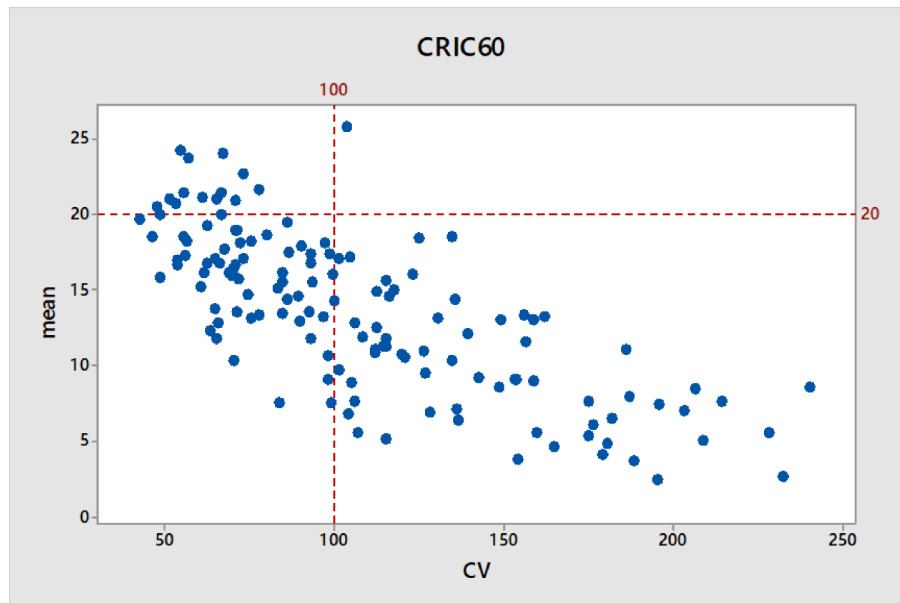


Figure 02: Visualization of mean yield/pick of selected CRIC60 palms with CV value

Conclusion

The results of current study indicated a positive selection in the second generation of AS palms for high and stable nut yield/year and nuts/pick compared to commonly cultivated CRIC60. Findings of this study could be used to select better mother palms for future breeding programme towards developing drought tolerant coconut cultivars/hybrids.

Reference

- [1] Central Bank of Sri Lanka, Annual report of year 2016: Central Bank, Colombo, Sri Lanka.
- [2] Coconut cultivation Board of Sri Lanka. Effect of water deficit (drought) on growth/productivity of coconut. <http://www.coconut.gov.lk/web/?p=effect-of-water-deficit-on-growth&locale=en>. 2013.
- [3] R.B. Mapa, Introduction, in: Mapa.R.B., Somasiri.S. and Dassanayake. A.R. (Eds.), Soils of Dry Zone of Sri Lanka. Soil Science Society of Sri Lanka., Peradeniya, Sri Lanka. pp.1-6. 2010.
- [4] B.V.R. Punyawardane, Evolution of climatic zones in Sri Lanka, in: Punyawardane, B.V.R. (Eds.), Agro-climatological Zones and Rainfall Pattern in Sri Lanka (in Sinhalese), Department of Agriculture, Sri Lanka. pp. 44-113. 2008
- [5] M.R.T. Wickramaratne, M.R.T. Breeding coconut for adaptation to drought. COCOS 6:16 23, 1987.