Research Article

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Factors contributing to female flower production and button shedding in coconut

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Abstract

Influence of various factors viz., varietal difference, irrigation, leaf area and dry matter production, on female flower production and shedding of buttons in coconut have been reported in this paper. Among the 16 varieties, comprising both Talls and Dwarfs, varietal difference was found to exist in female flower production and nut setting. However, between Talls and Dwarfs no significant difference in button shedding was observed. Although, increased female flower production was observed in the irrigated palms as compared to rainfed palms, the variation in button shedding between the two was not significant. Seasonal changes were found to influence the button shedding. Leaf area and dry matter production did not influence the button shedding. However, an indirect relation has been observed between leaf area and shedding of buttons via female flower production. The observations clearly indicated that shedding of buttons is directly related to the number of female flowers produced in a bunch. An attempt has been made to check the button shedding by spraying salicylic acid and encouraging results have been obtained. This needs to be further investigated before coming to a conclusion.

Key words: Coconut, button shedding, female flower production, varieties

Introduction

Shedding of buttons is one of the major constraints in coconut production. The production of large number of female flowers, good fruit set and retention of nuts have an important role in improving the production potential of the palms. This can be achieved by checking the button drop. Under normal conditions within three months of the opening of the inflorescence about 80% of the female flowers may shed. Various reasons have been attributed if the shedding exceeds the normal level (Menon and Pandalai, 1958). Extensive reports are available on the impact of various factors on the shedding of buttons (Sudhakara, 1990, and Ramadasan *et al.*, 1991). During summer months under unirrigated condition, soil water deficit is the major cause for the shedding of buttons, which gets aggravated with the changes in the micrometeorological variables. Although high rainfall is not harmful to the palms growth and productivity, shedding can be observed due to the impairment of pollination and fertilization (Menon and Pandalai, 1958). In annual crops, flower enhancement, increased pod number and yield have been observed by spraying with salicylic acid (Singh and Kaur, 1980 Anandhi and Ramanujam, 1997). In coconut also various chemicals viz., 2 4-D (Gangolly *et al.*, 1959), and Triacontanol (Anon.1988) have been tried for controlling the shedding of buttons, which did not give encouraging results. Varieties with high fruit set are desirable for crop improvement strategies. Hence, a systematic approach is essential to understand the factors contributing to female flower production and shedding of buttons in coconut.

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The present paper reports (a) varietal differences in female flower production and retention, (b) influence of irrigation on female flower production and nut yield, and (c) leaf area and dry matter production in relation to button shedding. An attempt has also been made to control the shedding of buttons during the initial stages of development by chemical treatment.

Materials and Methods

Observations on varietal differences in button shedding and nut development have been recorded from 18 years old coconut varieties growing under rainfed conditions.[1] Influence of irrigation on female flower production and nut retention was observed every month continuously for two years in 22 years old coconut palms of West Coast Tall (WCT), WCT x Chowghat Orange Dwarf (COD) and COD x WCT, growing in red sandy loam soil. The same palms were used for evaluating the influence of leaf area (LA) and dry matter production (DM) on female flower production and button shedding. Leaf area and dry matter production were estimated by using the regression equation developed by Ramadasan and Jacob Mathew (1987).

A trial was conducted to control the shedding of buttons by chemical treatment. For this 100 ml of 2 m M salicylic acid was sprayed on the inflorescence just at the time of opening and one month after the opening of the inflorescence. The observations were carried out monthly up to four months of maturity of bunches. Data was analysed by using analysis of variance technique and correlation coefficient was worked out as per standard methods (Panse and Sukhatme, 1967).

Results and Discussion

(a) Varietal differences in shedding of buttons and nut yield

Significant differences (P=0.05) have been observed in female flower production, shedding of buttons and nut production between the cultivars (Fig.1). Among the 12 tall cultivars, Laccadive micro and among the four dwarf cultivars, MGD produced more number of female flowers (356 and 255 respectively). Among the tall cultivars higher nut set (46%) and lower rates of button shedding (54%) were observed in Laccadive micro. Among the dwarf cultivars, although higher female flower production was observed in MGD, higher nut retention was noticed in MYD (38%). However, between Talls and Dwarfs, significant difference was not observed in the shedding of buttons. Observations on the number of female flowers produced in the bunches showed that 5 to 6% of the bunches had < 10 and >70 female flowers and 64% of bunches had up to 30 female flowers, while in 10 to 15% of bunches, 50 to 70 female flowers were noticed.

(b) Seasonal variation in female flower production and button shedding under irrigated and unirrigated conditions

Female flower production and shedding of buttons were recorded every month in local Tall variety, WCT and two hybrids, WCT x COD and COD x WCT under irrigated and rainfed conditions for two years. The trend in female flower production and shedding of buttons remained more or less similar during both the years. In general all the varieties exhibited lower female flower production in post monsoon season as compared to summer (February to May) and monsoon (June-September) months (Table 1). Irrespective of irrigation or rainfed condition, button shedding occurred in two peaks in all the varieties, one during summer months and the other during monsoon. During post monsoon season, the number of female flower production was less, consequently the drop percentage was also less in all the varieties. Although, increasing trend in female flower production was observed in the palms under irrigated condition between irrigated and rainfed conditions, the female flower production and percentage button shedding did not differ significantly in any of the varieties. Analysis of the data clearly showed female flower production and percentage drop varied significantly only between different months.

Table 1. Seasonal variation in female flower production (No.)and button shedding under irrigated (Irr) and rainfed (RF) conditions (Mean values)

Period	Parameters	WCT		CODxWCT		WCTxCOD	
		RF	Irr	RF	Irr	RF	Irr
Pre-monsoon	FFP	29.0	30.0	24	29	22	32
(Feb-May)	% drop	64.2	54.3	44.3	47.7	47.2	56.7
Monsoon	FFP	28	20	29	24	23	25.0
(June-Sept.)	% drop	76.6	63.4	56.6	64.9	60.8	70.9
Post-monsoon	FFP	17	19	16	16.0	15	20.0
(Oct-Jan)	% drop	38.3	45	32.1	39.6	33.0	50.0
Mean	FFP	25.0	23	2.3	23	20.0	26.0
	% drop	59.1	54.2	44.3	50.7	47.0	59.2

	SE plot^{-1}		CD (P=0 05)	
	Female flowers	% drop	Female flowers	% drop
Variety	11.07	19.82	NS	NS
Months	7.89	19.61	13.54	12.81
Irr. *vs* RF	18.55	26.72	NS	NS
Treat. *vs* Variety	13.87	43.76	NS	NS

Fluctuations in coconut yield during different years have been explained on the basis of variation in rainfall

pattern (Rajagopal *et al.*, 1996) and the relation between rainfall and button shedding have been reported by Rao (1991). Nelliat and Padmaja (1978) reported the beneficial effect of summer irrigation on nut yield. In the present observation, increasing trend in female flower production was observed under irrigated condition, irrespective of variety/hybrids.

(c) Leaf area and dry matter production in relation to nut production

Leaf area (LA) and drymatter (DM) production in relation to female flower production and nut yield was evaluated in the same palms in which seasonal variation in female flower production was recorded under unirrigated and irrigated conditions. Cultivar differences were not significant in any of the parameters studied (Table 2). However correlation worked out between the parameters indicated high correlation between LA and female flower production as well as LA and nut production (Table 3). Dry matter production did not show any relation with the shedding of buttons. However, a high correlation (r^2 = 0.690***) has been observed between female flower production and shedding of buttons, thus implying that the increase or decrease in the button shedding depends on the number of female flowers in the spadix. This corroborates with the earlier report by Kasturi Bai and Khan (2002).

Table 2. Canopy area, dry matter production and yield related parameters in coconut cultivar/hybrid under un-irrigated and irrigated conditions (Mean values)

Cultivars	LA (m^2)	LDM (kg)	SDM (kg)	FFP (No.)	NP (No.)	BS (%)
WCT	90.3	39.7	4.6	379	132	62
WCTxCOD	89.3	42.4	5.2	415	145	64
CODxWCT	83.4	38.1	3.9	457	137	62
CD (P= 0.05)	NS	NS	NS	NS	NS	NS
Treatments						
Un-irrigated	86.1	37.6	4.4	364	125	61
Irrigated	89.2	42 .5	4.7	470	151	65
CD (P=0.05)	NS	NS	NS	NS	NS	NS
CV%	13.95	15.27	21.13	49.33	26.61	23.10

Table 3. Correlation between different parameters and button shedding

	LA	LDM	SDM	FFP	NP	BS
LA	—	NS	NS	0.424	0.449	NS
LDM		—	0.559**	NS	NS	NS
SDM			—	NS	NS	NS
FFP				—	0.608***	0.690***
NP						NS

** &*** significant at 1% and 0.1% level and NS non-significant

(LA- Leaf area, LDM & SDM- leaf and stem dry matter, FFP female flower production, NP nut production, BS - button shedding)

Table 4. Effect of salicylic acid spraying on coconut bunches (Mean of 25 bunches)

Treatment	FFP (No.)	Setting (%)	Shedding (%)
Control	28 (8-85)	19	81
Treated	24 (9-59)	35	65
CD: P= 0.05	NS	6.79	7.13

Vigour is an expression of LA and DM production and importance of studies on these two traits for improving the productivity of palms have been highlighted by Foale (1993), and Kasturi Bai *et al.* (1996). Ramadasan and Chacko Mathew (1977) observed that early flowering palms show a higher rate of leaf production than late flowering palms. Every leaf axil is capable of producing an inflorescence, more so the formation of the primordium of the rudimentary inflorescence starts at about the same time as the subtending leaf. The correlation between LA and female flower production, corroborate with the report by Ramadasan and Chacko Mathew (1977) that only a rapid rate of leaf production coupled with a large number of leaves on the crown ensure adequate carbohydrate reserve in the trunk, required for the early commencement of flowering.

(d) Control of button shedding by chemical treatment

Spraying of 100 ml of 2 mM salicylic acid on the bunches just at the time of opening of the inflorescence and one month after the opening indicated that, in the salicylic acid sprayed bunches, button retention ranged from 14.3% to 64% as against 1.2% to 50% in unsprayed ones. In general, 16% increase in button retention was observed in the bunches sprayed with 2 m M salicylic acid as compared to the unsprayed bunches. The treatment effect was found to be more during early summer than late summer.

Action of salicylic acid on flower induction, disease resistance, growth and yield of crop plants has been reported by Raskin (1992). In black gram cultivars flower enhancement has been observed (Anandhi and Ramanujam, 1997) whereas in mug beans, Singh and Kaur (1980) observed increased pod number and yield in salicylic acid treated plants. In coconut palms significant improvement in button retention was observed in the sprayed bunches as compared with the control bunches.

Conclusions

From the results it is clear that the variation in shedding of buttons is a varietal characteristic, which get aggravated by abiotic stress. Spraying of salicylic acid gave encouraging results in the control of button

shedding. However, this needs to be further investigated in a large scale before coming to a conclusion.

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