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Effect of Spraying 2, 4-D on Setting, Yield and Nut Characters in Coconut

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Introduction: Coconut produces a far higher number of female flowers than that set into nuts. The phenomenon of shedding of female flowers, or buttons as they are popularly called, is universal in nature and this problem has been studied by coconut research workers in various countries. It has been estimated that on an average under plantation conditions 75 to 80% of the female flowers produced are shed (Patel, 1938; Gangolly, 1953). Different workers have attributed the shedding of buttons to varied causes like fungal infection, incidence of pests, defective pollination and fertilization, structural defects in the flower, abortion of embroys, physiological condition of the tree, limitation in yielding ability of trees, *etc.* Attempts to control the shedding by fungicidal or insecticidal treatments and artificial pollination have met with little success. The possibility of the formation of an abscission layer at the point of attachment of the female flower to the stalk has been advanced as a possible cause for the shedding of the buttons and it has been suggested in this connection that spraying with harmones might be tried to check the incidence. (Gadd, 1923; Child, 1950). This paper presents the results of a trial of spraying the coconut inflorescence with a solution of the hormone 2, 4-dichloro-phenoxy acetic acid, conducted at the Regional Cocount Research Station, Veppankulam.

Materials and Methods: The trial was initiated during the 1967 summer season on eight adult palms of the tall variety selected for high female flower production and low setting. The inflorescence that emerged in March, 1967 on each tree was sprayed with 60 ppm solution of the hormone 2, 4-D by means of an atomizer and a quantity of 50 ml was used per inflorescence. Each inflorescence was given four sprays at weekly intervals commencing from the stigmatic receptivity of the female flowers. The inflorescence emerging next to the sprayed bunch on each tree formed the control.

The number of female flowers that were retained was recorded for the sprayed bunches at weekly intervals for four weeks, at fortnightly intervals for the next two fortnights and at monthly intervals thereafter till harvest. At the time of harvest, the number of female flowers finally retained and the number of good nuts harvested were recorded for both the sprayed and control bunches. Observations on the nut characters *viz.*, the weight of whole

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and husked nut, weight of each nut component, thickness of husk, shell and kernel were recorded for all the good nuts harvested. With the data gathered, the sequence of shedding of female flowers in the sprayed bunches and the effect of the hormone spray on the setting of female flowers and nuts and on the development of the nuts were studied.

Results: *Sequence of shedding of female flowers:* The data on the number of female flowers retained at the end of the specified intervals, the percentage of set at each stage and the percentage of female flowers shed during consecutive intervals from the time of spraying till harvest are presented in Table 1.

TABLE 1. *Setting after pollination*

	At the end of	Mean number of female flowers retained per bunch	Setting %	Shedding %
I	Week	43.1	100.0	—
II	,,	37.3	86.5	13.5
III	,,	34.4	80.0	6 5
IV	,,	33.1	76.8	3.2
III	Fortnight	30.8	71.5	5 3
IV	,,	28.4	65.9	5 6
III	Month	26.8	62.2	3.7
IV	,,	26.6	61.7	0 5
V	,,	23.6	54.8	6 9
VI	,,	23.3	54.1	0 7
VII	,,	21.3	49.4	4.7
VIII	,,	20.0	46.4	3 0
IX	,,	19.3	44.8	1 6
X	,,	18 5	42.9	1.9
XI	,,	18.1	42.0	0 9
XII	,,	18.1	42.0	—

Note: The mean number of female flowers produced per inflorescence at the time of spraying was 43.1.

Out of a mean of 43.1 female flowers produced per inflorescence, 18.1 flowers were finally retained giving a percentage set of 42.0. There was no shedding of female flowers in the first week after spraying (or stigmatic receptivity). The maximum shedding had taken place in the second week. About 38% of the total production of female flowers was shed within the first three months and another 20 % was shed from the 4th to the 11th month.

Female flower production setting and yield of nuts : The data on the number of female flowers produced, the number and percentage of female flowers finally retained on each inflorescence and the number and percentage of good nuts harvested were analysed statistically by working out the standard error of the mean difference of the pairs of observations and applying the test of significance. The differences between the sprayed and control bunches with regard to any of these characters were not significant.

TABLE 2. *Productive characters*

Characters	Mean		Significant or not (P=0.05)	S.E. P=0.05
	Sprayed	Control		
No. of female flowers produced	43.13	40 5	N.S.	3.73
No of female flowers finally retained	18.13	7 38	N.S.	6.14
Percentage of female flowers retained	41.9	21.5	N.S.	8.96
No. of good nuts harvested	11.0	7 0	N.S.	2.73
Percentage of good nuts harvested to total female flower production	29.4	20.9	N.S.	5.95

N.S. = Not Significant

Nut characters : The data on the various nut characters were also statistically analysed and the results are summarised in Table 3.

TABLE 3. *Nut characters*

	Mean		Significance (P=0.05)	S.E. (P=0 05)	C.D. (P=0.05)
	Sprayed	Control			
Weight of whole nut (gm)	439.16	786.89	Sig.	50.14	118.5
Weight of husked nut (gm)	278.50	382.44	Sig.	23.30	55.11
Weight of husk per nut (gm)	303.54	404 48	Sig.	33.20	78.50
Weight of kernel per nut (gm)	151 52	195.54	Sig.	9.29	21.97
Weight of kernel per bunch (gm)	1615 80	1421 85	N.S.	309.90	—
Weight of kernal per nut (gm)	27.00	25.20	N.S.	1.09	—
Weight of shell per nut (gm)	92.80	115.85	Sig.	4 93	11.66
Weight of milk per nut (gm)	46.68	71.04	Sig.	10.64	25.06
Thickness of husk (cm)	1.63	1.62	N.S.	0.17	—
Thickness of kernel (cm)	1.14	1.10	N.S.	0.03	—
Thickness of shell (cm)	3.13	3.50	N.S.	0.18	—

Sig=Significat N.S.=Not significant

The differences in the weight of whole nut and all the nut components between the sprayed and control bunches were significant. The differences in the weight of kernel per bunch, thickness of husk, kernel and shell were not significant.

The percentage of each nut component to the weight of whole nut was worked out.

The differences between the sprayed and control bunches in respect of the percentage of shell and milk to the weight of whole nut alone were significant.

Discussion : Under natural conditions, heavy shedding of female flowers takes place even in the first week after stigmatic receptivity and the shedding after six weeks of receptivity is almost negligible. (Gangolly, 1953). The data on the sequence of shedding in the bunches sprayed with 2, 4-D revealed a pattern somewhat different from the normal. There was no shedding in the first week after receptivity, indicating that the hormone has had an immediate effect in retarding the shedding. The process of shedding was spread out over much longer period, some shedding occurring almost every month till the 11th month after flower opening. The peak shedding however occurred during the second week, while under natural conditions the heaviest shedding has been reported in the second and third weeks after receptivity (Gangolly, 1953).

The mean female flower production in the sprayed and control bunches was almost the same, but the percentage of female flowers retained in the sprayed bunches (nearly 42%) was nearly double than in the unsprayed bunches. The setting of 21.5% for the control bunches *i.e.*, under natural conditions was the same as that recorded by earlier workers (Patel, 1938 and Gangolly, 1953). Inspite of the marked increase in setting, the differences between the sprayed and control bunches were not statistically significant. While almost all the female flowers retained, developed into good nuts in the unsprayed bunches, only 11 out of 18 flowers retained (61%) developed into good nuts in the sprayed bunches. The remaining female flowers retained were either undeveloped or partially developed on the inflorescences.

A notable effect of the hormone was the reduction in the size of the nut and the weight of every component of the nut *viz.*, the husk, the kernel, the shell and the milk were significantly reduced due to the action of the hormone. Similar reduction in the mean weight and volume of unhusked nut and the quantity of copra per nut has been reported from the trials with hormone mixtures of 2, 4-D with Indole butyric acid and Indole propionic acid at the Central Coconut Research Station, Kasaragod (Anon., 1958). Though there was a significant reduction in the weight of kernel per nut due to the hormone, the total weight of kernel per bunch was not significantly different between the sprayed and control bunches. This finding is at variance with that reported by Gangolly *et al* (1956) and Gangolly and Gopalakrishnan (1957) who found that the sprayed bunch gave a significantly higher yield of copra per bunch than the untreated bunches. Though the hormone induced a marked reduction

in the size of the nut and every nut component, it has not had any effect on the thickness of husk, the kernel and the shell.

There was no difference between the sprayed and unsprayed bunches with regard to the proportion of the husked nut, husk and kernel. But the percentage of milk was proportionately lower in the nuts from the sprayed bunches as compared to the other components. This was apparently due to a greater reduction in the cavity of the nut.

Summary: The results of a trial of spraying the coconut inflorescence with a 60 ppm solution of the hormone 2, 4-dichloro phenoxyacetic acid have been reported. The spraying was found to result in a significant reduction in the weight of whole nut and in the weight of all the nut components. Though the hormone spray improved the setting of female flowers and the number and percentage of good nuts harvested, it was not effective in increasing the total output of kernel per bunch significantly.

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