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Effect of defoliation on yield of peanuts (Arachis hypogaea)

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Summary

The effects of three levels of defoliation applied at early flowering and at mid-pod-setting of peanuts were investigated. A high degree of tolerance to loss of leaf was demonstrated. Compensation following early leaf removal was shown provided terminals were not also removed. The effects of late defoliation were less when the terminals were also removed than when they were left intact.

These results are discussed in the context of defoliation caused by *Heliothis punctiger* Wallengren, and the conclusion is drawn that only exceptionally high populations of this pest warrant chemical control.

1. INTRODUCTION

Peanuts grown at Kingaroy (26° 32′; 151° 50′) in the Burnett region of Queensland are subject to attack by the native budworm, *Heliothis punctiger* Wallengren during late spring and early summer. Larvae feed mainly on young leaves, and to some extent on terminals, with the result that plants develop an obviously ragged appearance. As a consequence many growers apply insecticides for control. Local observations suggest that such loss of foliage and terminal growth does not markedly affect yield and that pesticide applications are of little, if any, economic value to the producer.

Enyi (1975) demonstrated that peanuts were most sensitive to defoliation during flowering and early pod production (that is 8 to 12 weeks after planting), and that 40% defoliation reduced yield at these stages only. Greene and Gorbet (1973) defoliated by mowing and concluded that yield depression followed 50% defoliation at 8 to 9 weeks post planting and that 33% defoliation reduced yields at 13 or more weeks only after sowing. French (1973) correlated mechanical defoliation and *Heliothis* sp. foliage consumption and concluded that a threshold of 13 caterpillars per metre of row was necessary before economic injury occurred. He did, however, suggest that the figure might be conservative when conditions were favourable for good foliage growth.

The present investigation was designed to obtain some defoliation and yield reduction data under Queensland conditions and to relate these to numbers of *Heliothis* larvae and possible plant damage.

2. MATERIALS AND METHODS

A trial was carried out using Virginia Bunch peanuts planted on 7 November 1973 on a red Kraznozem soil at the Department of Primary Industries field station at Kingaroy with normal district raingrown crop management practices.

Treatments were applied by removing leaves or leaves plus terminals with secateurs. Defoliation was aimed at removing a low, medium or a high percentage of leaves, or these levels plus all terminals at either 65 or 98 days post planting (that is at early flowering and mid-pod-setting, 83 and 50 days before harvest respectively). The trial therefore comprised 2 types (leaves and leaves + terminals) by 3 levels (low, medium and high) by 2 times of defoliation (early flowering and mid-pot-setting). These together with an untreated control were replicated in a factorial array 5 times, with plots each of 4 rows (0.9 m apart) by 12 m.

The removed foliage was oven dried and weighed after subsampling for separation of leaf and terminal. To develop a relationship between foliage removed and total foliage all above ground parts of a series of similar plants adjacent to the trial area were sampled and weighed on each date of defoliation.

Yields were taken from the central 2 rows × 11 m of each plot by mechanical pulling on 8 May, drying in the field and threshing on 29 May 1974. A 1 kg sample per plot was graded to the Queensland Peanut Marketing Board 1974 standards and yields were accordingly subdivided into edible kernel, oil grade and reject nut.

3. RESULTS

The three levels of defoliation removed 43% (low), 63% (medium) and 86% (high) of total weight of plant leaf at early flowering and 38%, 60% and 71% at mid-pod-setting. The type of defoliation made no real difference to these percentages as the weight contributions of terminals were minimal.

Most nuts were graded as edible kernel. No significant differences were shown among the small percentages of oil grade kernels and reject nut. No pattern of response was found in mean yields of edible kernel, and factorial analyses demonstrated statistically different relationships only as shown (Table 1).

Table 1. Mean yields (kg ha^{-1}) of edible grade peanut kernel following defoliation treatments

Defoliation treatment	Mean yield per plot*	Mean yields grouped treatments*	
early — low level	1399*ab*		
early — medium level	1461*a*	1345*b*	
early — high level	1174*bcd*		low level
early — low + terminals	1196*bcd*		treatments: 1314*a*
early — medium + terminals	1114*cde*	1083*a*	
early — high + terminals	939*e*		medium level
late — low level	1205*bcd*		treatments: 1309*a*
late — medium level	1304*abc*	1194*a*	
late — high level	1073*de*		high level
late — low + terminals	1455*a*		treatments: 1134*b*
late — medium + terminals	1359*ab*	1388*b*	
late — high + terminals	1350*ab*		
no treatment	1360		

*Means within columns not followed by the same letter are significantly different at $P < 0.05$.

4. DISCUSSION

The results demonstrate that peanuts grown in the Burnett region of Queensland have a high tolerance to defoliation and that only severe levels of defoliation reduce yields. The data

are, therefore, complementary to the results obtained by Greene and Gorbet (1973) and French (1973).

It is clear that peanuts can compensate for early leaf removal provided the terminals are not also removed, and that yield reductions following late loss of leaves are less when terminals are removed than when they are retained. Terminal removal presumably prevents the diversion of resources into further vegetative growth.

Limited studies carried out in association with the present work showed that *H. punctiger* larvae each consume approximately 0.85 g dry matter during development. Large numbers of larvae would be required to consume the amounts of leaf removed in the present study. It is probable, therefore, that under conditions which prevail in the Burnett the economic threshold for *H. punctiger* would considerably exceed the estimate by French (1973) of 13 larvae per row metre, and that only under most exceptional conditions would insecticide control of *H. punctiger* be warranted.

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