

# Development of an ablation tool for oil palm

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## Abstract

Ablation is the process of removing unopened inflorescence from oil palm plantations during juvenile period (1 to 3 years). The ablation tool developed consists of a long handle of 2.54 cm diameter GI pipe having 152.4 cm length. At one end of this pipe, a “U” shaped welded holder has been made of 1 inch flat with  $5\pm 1$  mm thickness and 19 cm length, which has a width of 2 cm at the welding point, and gradually widened to 5.2 to 5.7 cm at the outer end. A sharp pointed nail having 6.5 cm length and 5 to 8 mm diameter was welded at the centre of the “U” holder. In the traditional method of removing the inflorescence, at least 2.4 leaves were cut to remove one inflorescence whereas, with the developed tool, the leaves are not damaged or removed. Farmers generally avoid removal of the inflorescence during 1 to 3 years thereby hampering the growth and yield in the forthcoming years. The efficiency of the ablation tool is 125 inflorescence per hour.

**Keywords:** Ablation tool, inflorescence, oil palm

## Introduction

In India, oil palm is cultivated in an area of 3.16 lakh hectares, with a potential to grow in an area of 19.3 lakh hectares (Rethinam *et al.*, 2012). Oil palm is a monoecious crop where both male and female inflorescences are produced separately on the same palm. Each leaf axil has one floral bud which differentiates into male or female inflorescence.

The early development of inflorescence takes 2½ to 3 years (Fig.1), during which, it remains completely enclosed by the leaves and emerges from the leaf axil shortly before anthesis. Inflorescence is a compound spike or spadix carried on a stout peduncle and bears two large inflated bracts (spathes) which enclose the whole inflorescence.

Each inflorescence contains thousands of flowers. Flower opening starts first in the basal spikelets of the inflorescence. The removal of male and female inflorescences and fruit bunches produced during the juvenile period is called



**Fig. 1. Unopened inflorescence during 2½ to 3 years**

ablation. It improves the vegetative growth of palm by retaining the nutrients which are supposed to be used by developing inflorescences or fruit bunches. It also improves drought resistance capacity of young palms by improving shoot and root growth especially in areas where dry conditions exist (Ramachandruru and Manorama, 2013). Ablation should be done at

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monthly intervals by pulling out young inflorescences. At present, most of the farmers do not undertake ablation, undertake ablation partially or ignore it at different stages, affecting vegetative growth of young palms leading to poor yields. Due to lack of ablation, regular bearing of bunches and harvesting is not initiated even after completion of 3½ or 4 years after planting of oil palm. Ablation is not practised mainly because oil palm in juvenile period is fully covered with intercrop and it is difficult to reach each palm crown and undertake ablation.

Farmers practice ablation either by chisel or knife with a long handle. By inserting chisel or knife at the base of the inflorescence peduncle, with a simple push, the inflorescence is cut. While doing this, many leaves are cut leaving palms with a few numbers of leaves. Also while ablation, leaf spines may pierce into skin causing injury on the hands. Hence with the above factors in mind it necessitated to develop an appropriate tool which will have less drudgery, no damage to leaves, safe and manoeuvrable during intercrop period.

### Materials and methods

The ablation tool developed consists of a handle of 2.54 cm diameter GI pipe of 152.4 cm length (Fig. 2a). At one end of this pipe, a “U” shaped holder of 19 cm length is welded which has a width of 2 cm at the welding point, and is gradually widened

to 5.2 to 5.7 cm at the outer end (Fig. 2b). A sharp pointed nail of 6.35 cm length and 7 mm diameter is welded to the centre of the “U” holder (Fig. 2c). The weight of the ablation tool ranges from 1.90 kg to 1.95 kg. The operator has to locate the unopened inflorescence to be removed and push the U holder in to the inflorescence. In this process, the sharp needle pierces in to the inflorescence and with a small push the inflorescence gets broken and is hooked like a fish (Fig. 4). This tool can be easily and safely operated, at an angle of  $68^{\circ} \pm 10^{\circ}$  with respect to ground level.

Farmers generally use chisel to do ablation (Fig. 3a). While doing so, excess number of leaves are cut. From Table 1, it is clear that by using chisel, the average numbers of leaves cut to remove one inflorescence is 2.3, *i.e.*, to remove 42 inflorescence, 98 leaves have to be cut, affecting the photosynthetic rate of the palm

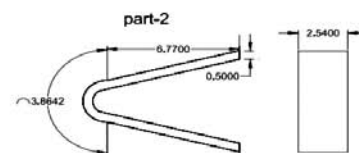
**Table 1. Ablation with chisel**

Trial	Time (minutes)	Number of inflorescences removed (Ablation)	Number of leaves cut
1.	3	8	16
2.	3	6	15
3.	2	3	13
4.	2	6	15
5.	2	6	13
6.	3	7	13
7.	2	6	13
Total	17	42	98



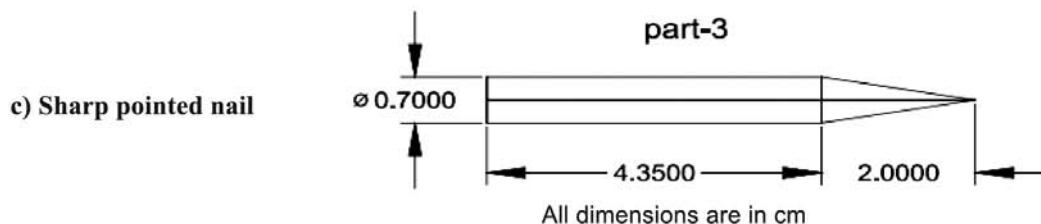
All dimensions are in cm

**a) GI pipe**



All dimensions are in cm

**b) 'U' shaped holder**



All dimensions are in cm

**c) Sharp pointed nail**

**Fig. 2. Drawings of different parts of ablation tool**

which is directly proportional to leaf area and there by affecting the growth and girth of the palm.

The ablation tool was tested (Fig. 3b) in 22 juvenile oil palm plantations in the state of Andhra Pradesh with 36 different operators.

Trials were conducted in oil palm plantations ranging from 1-3 years age. In one year old plantation, two trials were conducted, in two year plantation 12 trials were conducted and in three year old plantations, a total of eight trials were conducted. Ablation can be done at a maximum distance of 1.26 m to 1.38 m (Table 2).

damaged or cut by using ablation tool developed by ICAR-IIOPR, whereas on an average of 2.3 leaves were cut, if ablation is done by chisel.

A trial was conducted (Table 3) with five different operators to test the efficiency of ablation tool in farmers field. From Table 3, it is clear that operator 3 had removed 194 inflorescences in 90 minutes, which indicates that the minimum time taken to ablate inflorescence was 0.46 minutes and maximum time taken was 0.71 minutes. All the above operators were using the ablation tool for the first time.

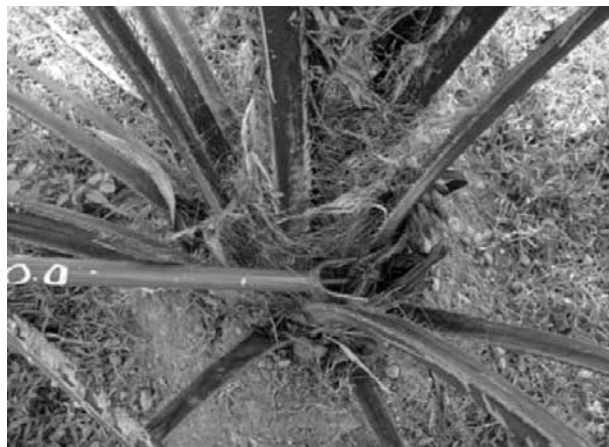
**Table 2. Features of ablation with the tool developed by ICAR-IIOPR in one year old plantation**

Number of trials	Number of palms trials	Min. distance from palm to operator in m (average)	Medium distance from palm to operator in m (average)	Max distance from palm to operator in m (average)
1	10	0.83	1.07	1.38
2	13	0.77	1.03	1.26
3	13	0.74	0.95	1.26
4	36	0.78	1.02	1.30

The average time taken to ablate one inflorescence was 2±1 seconds. On an average, in one hour, a person can ablate 108 inflorescences in one year old plantation. Average number of inflorescence ablated in two year old oil palm plantation is 125 h<sup>-1</sup>. Average number of inflorescence ablated in three year old oil palm plantation was 120 h<sup>-1</sup>. Not even a single leaf was

**Implication of using ablation tool**

It is estimated that every year an area of 20,000 hectares is being brought under oil palm cultivation. These plantation need to be ablated in next two years. Hence, it is required to practice ablation in an area of 60,000 hectares every year. Thus, it is estimated that at least 30,000 ablation tools will be required. In a day of 6 hours, a person can ablate 4-5 hectares



**Fig. 3. Ablation by a) traditional chisel and b) ICAR-IIOPR ablation tool**

**Table 3. Number of inflorescences removed by different operators**

Trial	Time (minutes)	No of inflorescences removed (ablation)				
		Skilled operator 1	Skilled operator 2	Skilled operator 3	Skilled operator 4	Skilled operator 5
1	20	38	32	48	41	41
2	15	45	29	54	50	34
3	15	28	23	27	23	21
4	10	10	9	17	16	15
5	5	2	-	4	4	2
6	15	28	20	31	34	20
7	10	16	13	13	10	12
Total	90	167	126	194	178	145



**Fig. 4. Operation of the tool: a) ablation tool, b) inserting the ablation tool on the inflorescence, c) pushing the inflorescence and d) lifting the inflorescence**

and 700-750 inflorescences. It is estimated that cost of ablating one inflorescence would be 45-50 paise with out damaging a single leaf.

### Conclusion

The ablation tool developed will be of immense help to farmers as drudgery involved is less, more handy, without any cutting/damaging leaves or injury to hands.

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