

# Flowering Induction of Longan Trees ( *Dimocarpus longan* Lour.) Grown In Sarawak

by

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## Abstract.

Under the tropical climate of Sarawak, Edaw longan trees can be induced to flower while flowering intensity of free-flowering Diamond longan can be improved by application of chemical agents such as potassium chlorate, sodium chlorate and 'Vita-min'. The use of sodium chlorate is recommended as it is easily available and the cheapest one to use. It can be applied as a soil drench at a rate of 15g per m<sup>2</sup> canopy. The best time of application is when trees have shoots of mature leaves with sign of new flushes. With this technology, cultivation of longan especially the high quality Edaw cultivar in the State can be promoted and encouraged to cater for domestic demand.

## 1. Introduction.

The longan ( *Dimocarpus longan* Lour.) is a sub-tropical fruit in the family Sapindaceae and is native to Southeast Asia. It is now primarily cultivated in China, Taiwan, Thailand, Vietnam as well as Queensland (Australia) and Florida and Hawaii (U.S.A). This fruit is considered one of the important economic fruit crops in South East Asia (Crane, 2000).

Longan planting materials from Florida such as Kohala and Thailand such as Baidum, Biew kiew, Chompoo, Fortune eye. Diamond, Ping pong, Edaw and Ezami were acquired by ARC, Semongok in the mid-eighties and since the nineties respectively for planting and evaluation purposes. Local nurserymen started to import and promote planting of free flowering cultivars such as Diamond and Ping pong in the late nineties. In 2001, an entrepreneur, Mr Tang Huat Tii started up a 600-tree orchard of Edaw longan at his farm at 14th mile Oya road in Sibul . He sourced his material from a friend in Chiangmai, Thailand and also learned the techniques of flowering induction from him. Since then, Mr Tang has been producing Edaw longan fruit to supply to local market, which was initially met with 'disbelief' from consumers. The effort made by Mr Tang in pioneering commercial cultivation of Edaw longan in Sarawak is most commendable.

The State Department of Agriculture, in recognising the potential of longan has recently recommended and promoted its cultivation under the Crop Development program.

In the natural state, cool winter months are necessary for the induction of flowering. Even then, floral initiation in longan is highly erratic and dependent on climatic conditions and fruit yield varies from season to season (Subhadrabandhu and Yapwattanaphun, 2000b). The use of potassium chlorate (KClO<sub>3</sub>) to induce flowering in longan trees was discovered by Dr Chung-Ruey Yen of the National Pingtung University of Science and Technology in Taiwan ( Matsumoto et al., 2004; Yen et al., 2003). Dr Yen was able to associate the use of fireworks during religious ceremonies with off-season production of longan flowers on trees near the temples. From this, he was able to identify potassium chlorate, which is an explosive, as the agent in producing flowers. This discovery has not only enabled growers to produce off-season longan and solved the problem of alternate bearing in traditional growing regions but also enable production of sub-tropical longan cultivars in tropical regions. Besides potassium chlorate, sodium chlorate( NaClO<sub>3</sub>) has been found to be as effective (Anon, 2003). The former is classified as an explosive and its availability is rather limited, while the latter is sold commonly as a weedicide. A third flowering agent under the trade name 'Vita-min' has been promoted and sold as a fertiliser recently by a nurseryman in Miri.



>> *Edaw longan in fullboom*

## **2. Field studies.**

Altogether, three studies on the effect of flowering agents namely: potassium chlorate (  $KClO_3$  ), sodium chlorate (  $NaClO_3$  ) and 'Vita-min' were carried out on three to four- year old edaw and diamond longan trees at ARC, Semongok, Tarat Station and Mr Tang's longan farm in Sibuluan in 2005 and 2006.

$KClO_3$  and  $NaClO_3$  were each applied in two rates at 10g and 15g per  $m^2$  canopy while Vita-min was applied at 30g and 60g per  $m^2$  canopy. A control treatment without any agent was also included in this study. The amount of  $KClO_3$  and  $NaClO_3$  required was first calculated based on canopy size of treated trees . It was then carefully dissolved in 4 gallons of water and applied as a soil drench in a 60 cm band round the canopy edge. Vita-min was applied in similar manner but via broadcasting. Assessment on flowering intensity of all treated trees was done one and half to two months' after treatments.

## **3. Results and Discussions.**

Longan fruit, which is similar to that of mata kucing is well-liked by the local populace. This fruit is usually imported from Thailand and China in the form of fresh fruit, dried and canned products. In 2004, the State imported 78.21 tonnes of longan valued at RM326,392 (Anon, 2004). However, in recent years, imported fresh longan fruits from Thailand were generally viewed to be 'loaded' with chemicals and as a result, many people would think twice about eating this fruit.

Being a sub-tropical tree, longan will not flower naturally under the tropical climate even though it can grow well vegetatively (Morton, 1987). This point is confirmed by the results of control trees which did not flowered at all. The introduction of free-flowering cultivars such as Diamond and Ping pong longan generated some interests in growing this fruit at one stage. But fruit quality of especially the former with its watery and soft aril is inferior to the imported longan, which has crispy and firm aril.

In traditional longan producing countries, chemical agents such as  $KClO_3$  and  $NaClO_3$  have been used to improved flowering during normal crop cycle and to 'induce' off-season flowering of longan trees (Anon, 2003 ). The rate of agent per tree varies with tree size. Too high a rate may cause severe defoliation, shoot and stem dieback and even tree death. Different methods have been employed by various parties to estimate the appropriate amount of agent to use. This include tree age, canopy diameter and canopy size.

In 2003, a 16 year-old Kohala longan tree at ARC, Semongok was successfully induced to flower and set fruit by  $KClO_3$  application. Similar result was obtained with the use of  $NaClO_3$  on the same tree the following year. Estimated fresh fruit yield was about 200kg per tree per year for both occasions. However, there was not much information on the rate of agents used, the state of growth of the tree and the resultant flowering intensity then.

On Edaw longan, results showed that all three chemical agents tested were equally effective in bringing about flowering of trees grown under local biophysical conditions. This trees can response to a certain range of rates used. For good results, application of agents should be made when trees have mature leaves with sign of new flushes. The findings here is in agreement with Mr Tang's claim that both  $KClO_3$  and  $NaClO_3$  are as good in promoting flowering.

Table 2: Average flowering intensity (%) of Edaw longan trees treated with different chemical agents at Mr Tang's farm, Sibiu.

Treatments	Flowering Intensity (%)	
	Actual	Angular
KClO3	96.3	82.2
NaClO3	90.6	77.9
Vita-min	80.6	71.2
SE(difference)		8.3
C.V (%)		21.5

However, Crane (2003) reported that KClO3 applied at 15g per m2 canopy (which is equivalent to the higher rate tested in this study) slightly reduced the amount of flowering shoots in Kohala tree to 84%.

Although Diamond longan tree is free-flowering under tropical conditions, flowering is usually rather patchy and irregular in intensity. This flowering habit presents a problem in the management of its production. All three chemical agents, each applied at a rate of 15g per m2 canopy were found to improve tree flowering and fruit set to over 80% as compared to only 26% in untreated trees. The benefit of these agents in Diamond longan production is obvious.

Table 3: Average intensity (%) of flowering and fruit set of Diamond longan trees treated with different chemical agents.

Treatments	Vegetative shoots	Flowering panicles	Fruit- peanut size	Fruit- marble size	Canopy size(M2)
KClO3	19.6	78	2.4	0	10.4
NaClO3	17.7	81.7	0.5	0	9.9
Vita-min	2	56.4	41.1	0.5	11.6
Control	74	1	21.5	3.5	13.3

\* The three chemical agents were each applied at a rate of 15g per m2 canopy.

Of the three chemical agents evaluated, NaClO3 is the most easily available and cheapest one to use, costing less than a ringgit per application( Table 4). At current market prices, the cost of NaClO3 to induce flowering of a four year-old edaw longan tree is between RM0.52 and RM0.78, depending on the rate used. Although 'Vita-min' is convenient to use (by broadcasting) but it is expensive. KClO3 is classified as an explosive and is not recommended.

Table 4: Application costs of different Flowering agents.

Treatments	Cost/kg (RM)	Application rates (g/m2)	*Amount of agent used. (g/tree)	Cost of agent/application (RM)
NaClO3	4	10	130	0.52
		15	195	0.78
KClO3	20	10	130	2.60
		15	195	3.90
Vita-min	13.3	30	390	5.07
		60	780	10.14

\* Based on an average canopy size of 4 year-old edaw longan trees, which is 13m2.

Results from studies showed that chemical agents namely,  $KClO_3$ ,  $NaClO_3$  and 'Vita-min' can be used successfully to induce flowering of Edaw longan and to improve flowering intensity of Diamond longan. Taking all the above points into consideration,  $NaClO_3$  applied as a soil drench at a rate of 15g per m<sup>2</sup> canopy is tentatively recommended for induction of flowering of Edaw, Kohala and Diamond longan trees in Sarawak. Trees in this case should have shoots of mature leaves with sign of new flushes.



>> Apply as a soil drench

With this technology on induction of flowering, the cultivation of superior quality Edaw longan in Sarawak by entrepreneurs and farmers can now be promoted and encouraged. Production of local Edaw longan can be staggered and scheduled accordingly to meet market demand and to avoid competing with longan imported from Thailand or China. Finally, one of the side benefit in growing longan is the incorporation of honey bees rearing in the farm. Honey from flowering longan trees is of superior quality. This activity not only provide extra income from sales of honey but the bees also assist in flower pollination and consequently, better fruit set.

#### **4. Conclusion.**

Longan trees can grow well vegetatively under the tropical climatic conditions of Sarawak but they will not flower especially for cultivars such as Edaw and Kohala. On the other hand, free-flowering cultivar such as Diamond longan usually has irregular flowers. These flowering problems of longan can be overcome by the use of flowering agents such as  $KClO_3$ ,  $NaClO_3$  and 'Vita-min'.

From the studies undertaken, all these agents were found to be equally effective to induce flowering of edaw and to improve flowering intensity of diamond longan. Amongst them,  $NaClO_3$  is the cheapest one to use and it is also easily available. As such, it is recommended for use as a soil drench at a rate of 15g per m<sup>2</sup> canopy.

The cultivation of longan, especially the subtropic cultivars in the State is now possible with the use of sodium chlorate flowering agent. As Sarawak imports quite a substantial amount of longan fruit each year, the Department of Agriculture is taking steps to promote cultivation of this new economic crop to farmers and entrepreneurs. Hopefully, local production of high quality Edaw longan will increase over the years to meet domestic demand and contribute towards import-substitution of this lovely fruit.

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