

The research result of the affect of some growth inhibition products to cashew flowering, fruit setting and yield in Cam Ranh, Khanh Hoa province

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1. PREAMBLE

Cashew (*Anacardium occidentale*) is a fast growing, perennial industrial crop which meets the needs for export and brings in significant sources of foreign currency for the country's economy. According to the Vietnam Cashew Association, the cashew area of the country covers about 400,000 ha with the total production of 300,000 tons. The cashew kernel export production reaches 85,000 tons, ranking in the second after Indian.

In Vietnam, the cashew tree mainly produces flowers naturally in the season, having little people's impact. Therefore, the cashew has a great influence on the market price, which makes cashew farmers have a lot of difficulties. Moreover, the climate change is also the direct reason for the cashew quality and yield. Currently, applying the growth inhibition products in Vietnam to treat off-season flower, nut setting has been conducted with kinds of trees (orange, mandarin, longan, mango, durian, custard - apple tree...) and obtained many remarkable achievements. However, there haven't been any projects on cashew so far. If the new project gains success, an opportunity for cashew production will be open.

At Khanh Hoa province, cashew is considered as a long - day tree to develop toward the commodity production for domestic consumption and export.

Cam Ranh is in the south of Khanh Hoa province. As in Ninh Thuan, Binh Thuan provinces, It has the dry climate with the rainfall of 1,441 mm/year and the average water evaporation of 1,450 mm/year. But the climate condition is suitable for the ecological requirement of the cashew because of the dry season in the flower and fruit setting stage. However, prolonged drought has influenced much on the cashew yield and quality. The 2003 survey data stated that the cashew tree had been soon cultivated with a small quantity of dispersion for many years before 1975. Until now, more than 3.000 ha cashew in the province have mainly concentrated in Khanh Vinh district, Cam Lam, Cam Ranh town, which has the average yield of 4.2 quintals/ ha (equivalence to 60 % the cashew yield of the country) and the production of 1,212 tons (only satisfying 10.52% capacity of the 3 cashew nut processing enterprises of the province).The total natural area of the Cam Ranh town is 70,000 ha, of which has

27,544 ha on mountainous - hilly soil. However, the area in mountainous and hilly soil has used ineffectively for a long time. While the forest area has been narrowed because of uncontrolled exploitation, deforestation for field and low vegetation mulching, the hilly- mountainous soil has had a wide tendency, which causes the imbalanced ecology and influences seriously on the agricultural production and life. Although the cashew tree of the Cam Ranh town has a fluctuation in the area, the cashew growers' income has increased in the recent years due to the stable price of cashew nut, so there are currently more than 500 ha cashew . Thanks to models of economic and environmental cashew, the Cam Ranh town has identified the cashew tree as economic commodity and make a strong policy to utilize the acreage of hilly-mountainous and waste land, which contributes to giving employment, economic development, hunger eradication and poverty mitigation, sources of inputs for processing factory.

The stage of cashew flower and fruit setting starts from 1-3 annually. This is the time when cashew is susceptible to North-Winter monsoon with the dull and drizzly weather. Therefore, it influences not only directly the process of pollination and fertilization but also seriously the fruit quality and yield due to frequent insect and disease. Moreover, cashew produces in uniform flowers (due to properties of genetic variety), lasting the cashew cropping season, which causes the cost of management and harvest. Most of the cashew orchards bearing fruit grow seeds from sources of mixed varieties, resulting in the low yield, instability and bad nut quality.

Due to climate change for continuous years, cashew orchards have had a failure of crops, so the cashew growers' income is low and ineffective. The farmers even cut down the orchard cashew in the harvest stage to cultivate kinds of other plants.

Therefore, researching on "*Research on the affect of some growth inhibition products to cashew flowering, fruit setting and yield in Cam Lam, Khanh Hoa province*" is very necessary.

2. RESULTS AND DISCUSSION

2.1. The affect of some growth inhibition products to cashew flowering, fruit setting and yield in Cam Bac commune, Cam Lam district, Khanh Hoa province

In the years of 2007 and 2008, the experiments of treating the cashew growth inhibition products at Mai Van Dong's household (Tan An village, Cam An Bac commune, Cam Lam district, Khanh Hoa province) has been conducted with 6 treatments. Scale: 5 plants/ replication x 3 replications/treatment x 6 treatments = 90 plants (4,500 m²)

Spraying the growth inhibition products on cashew at the young bud stage, then tightening branches with scissor to produce flowers as a wish.

Treatment 1: Applying the growth inhibition products is Potassium chlorate concentration 1-2% on plant, then tightening branches with scissor.

Treatment 2: Applying the growth inhibition products is KNO₃ concentration 1-2% on plant.

Treatment 3: Applying Paclobutazol concentration 1-2% on plant.

Treatment 5: Spraying the growth inhibition products is potassium chlorate concentration 1-2% on plant but not tightening branches with scissor.

Treatment 6: (control) No applying the growth inhibition as well as no tightening branches.

In 2008, most treatments produce flower- buds, of which the bud rate of CT5, CT3 and CT4 treatments is from 73.1- 86.2% and higher than the other treatments. A number of bunches/m², a number of fruits/bunches are higher than the control, of which a number of fruits/branches in the CT4 treatment is the highest and higher than all of the remaining treatments. Therefore, the CT4 yield is 719.7 kg/ha, 215.4% higher than the control one and exceeds the remaining treatments with 10.0 – 78.4 % .(Table 1)

Despite the severe condition of the region in 2007, CT4 produces flower-buds and harvests while the yield of the remaining treatments is low, even no flower and fruit setting. Therefore, CT4 (sprinkling KNO₃ under the root, then watering) produces flowers and reaches high yield in the 2 year successive experiment.

Table 1. The situation for the cashew growth and yield in the 2008 growth exhibition experiment in Cam An Bac, Cam Lam, Khanh Hoa.

Treatment	Heigh of tree (m)	Diameter in Canopy	A number of bunches/ m ²	A number of fruits/m ²	Yield (kg/ha)	Compared to control (%)
CT1 (Spraying Potassium 1-2% and tightening branches	4.2	5.0	9.2	4.7	654.3	195.8
CT2 (Spraying KNO ₃ 1-2%)	4.1	4.7	9.3	4.6	602.4	180.3
CT3 (Spraying Parloputazol 1-2%)	3.7	4.3	8.3	4.8	475.0	142.1
CT4 (Sprinkling KNO ₃ 150g/tree under the root and watering	4.1	5.1	8.7	5.4	719.7	215.4
CT5 ((Spraying Potassium 1-2%	4.0	5.2	8.3	3.2	403.5	120.7
CT6 (No spraying - control)	4.3	5.6	6.3	2.9	334.2	100.0
Cv%	-	-	-	-	8,2	-
LSD 5%	-	-	-	-	58,4	-

Initial identifying an effective treatment for cashew flower and fruit bearing in the arid region of Cam Lam is CT4 treatment.

2.2. Economic benefits of experiment treatments for 6 year cashew growth inhibition in Cam An Bac, Cam Lam, Khanh Hoa.

Table 2. Economic benefits of experiment treatments for 6 year cashew growth inhibition in Cam An Bac, Cam Lam, Khanh Hoa in 2008.

Treatment	Yield (kg/ha)	Increased incomings compared to control		Increased expenses (1000d)		Total increased expenses	Net interest (1000 d)	Rate of profits (times)
		kg/ha	1.000 d	Materials	Man-month			
CT1 (Spraying Potassium 1-2% and tightening branches)	654.3	320.1	3,841.2	3,000.0	266.0	3,266.0	575.2	0.17
CT2 (Spraying KNO ₃ 1-2%)	602.4	268.2	3,218.4	1,200.0	266.0	1,466.0	1,752.4	1.19
CT3 (Spraying Parloputazol 1-2%)	475.0	140.8	1,689.6	4,000.0	266.0	4,266.0	- 2,576.4	- 0.60
CT4 (sprinkling KNO ₃ 150g/tree under the root and watering)	719.7	385.5	4,626.0	1,800.0	266.0	2,066.0	2,560.0	1.23
CT5 ((Spraying Potassium 1-2%)	403.5	69.3	831.6	3,000.0	266.0	3,266.0	-2,434.4	-0.75
CT6 (No spraying - control)	334.2	-	-	-	-	-	-	-

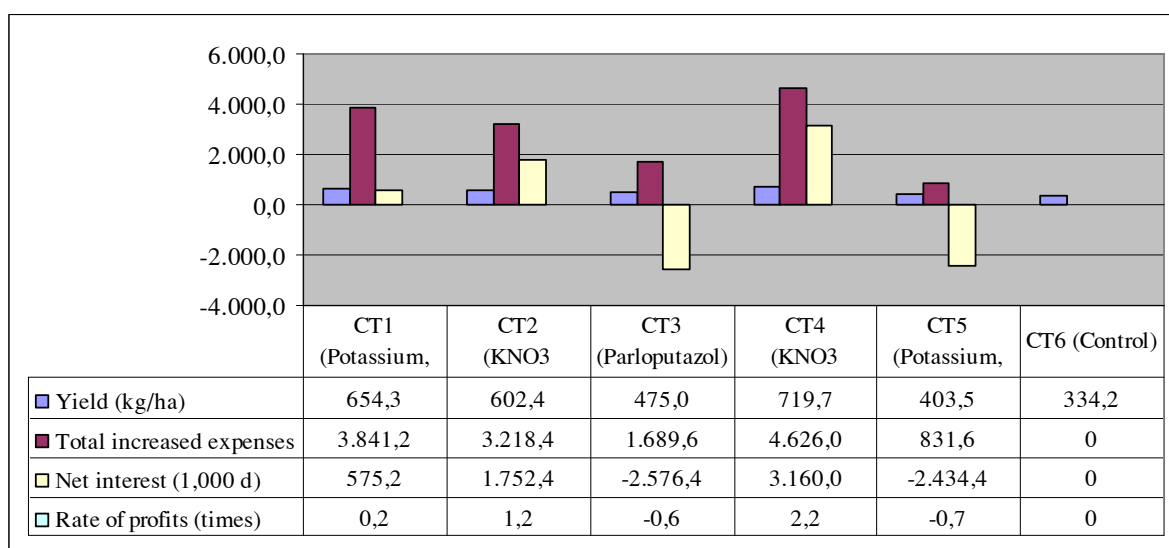
Note:

In 2008, the price of raw cashew nut is 12,000 VN dong/kg; Potassium Clorat is 150,000 VN d /kg; Parlobutazol is 200,000 VN d/kg

+ Increased expenses = mineral fertilizer expenses

+ Increased income = superior income cost from increased yield of the treatments (increased kg/ha compared to control x the price of raw cashew nut in 2008).

The experiment treatments for the cashew growth inhibition give 69.3 – 385.5 kg/ha higher yield than the control, of which the highest one is CT4 (sprinkling KNO₃ 150g/tree under the root and watering) surpassing the control with 385.5kg/ha while the lowest one is CT5 (spraying Potassium 1-2%) surpassing the control with 69.3 kg/ha. Increased net interest in the CT4, CT2, CT1 treatment is higher than the control with 575,200 – 2,560,000 VN d/ha, the highest is CT4 with 2.560.000 VN d/ha increased net interest compared to the control. Although, CT3 and CT4 treatments have 63.9 – 104.8 kg/ha higher increased yield than the control, they suffer loss from 2,434,400 – 2,576,400 VN d/ha. Therefore, the treatments for the growth inhibition bring the various economic benefits. In which, CT4 (sprinkling KNO₃ 150g/ tree under the root and watering) obtains the highest yield and economic benefits.



3. CONCLUSION AND RECOMMENDATION

3.1. Conclusion:

In 2 years' experiments, the treatments for 6 year cashew growth inhibition give the various yield and surpassing the control with no treatment 69.3 – 385.5 kg/ha. CT4 treatment (applying KNO₃ 150g/tree with sprinkling under the root and watering) is identified to bring the highest economic benefit.

3.2. Recommendation:

Applying KNO₃ 150g/tree with sprinkling under the root and watering can be initially conducted for business cashew orchards. However, applying some of the cashew products is very new in Vietnam, so the experiments for 1-2 crops should be made to get more complete results.

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