
Effect of manure and chemical fertilizer on vegetative growth of Off-season durian production

Somporn Na Nakorn^{1*} and Chaiporn Chalumpak²

^{1, 2}. Department of Plant Science, Faculty of Agriculture, Rajamangala University of Technology Srivijaya, Nakhon Si Thammarat, Thailand 80110

Somporn , N. N. and Chalumpak , C. (2015). Effect of manure and chemical fertilizer on vegetative growth of off-season durian production. *Journal of Agricultural Technology*11(8): 2523-2529.

The effect of manure and chemical fertilizer on vegetative growth of off-season durian production had been studied in the experimental plots in local orchards of Mr. Prapan Dangphom, located in the Krungching sub - district, Noppitum district, Nakhon Si Thammarat province, Thailand. Ten-year-old field-grown durian trees were used in this study during January, 2014 to June, 2014. A completely randomized design (CRD) with single tree plots replicated five times, a total of 45 durian trees was used as experimental units where one tree represent a replicate of the different treatments as follows : 1) untreated trees 2) chemical fertilizer 15-15-15 (NPK) at the rate of 4 kg/tree 3) chemical fertilizer 15-0-0 (NPK) at the rate of 4 kg/tree 4) cow manure at the rate of 50 kg/tree 5) chicken manure at the rate of 30 kg/tree 6) chemical fertilizer 15-15-15 (NPK) at the rate of 2 kg/tree + cow manure at the rate of 25 kg/tree 7) chemical fertilizer 15-15-15 (NPK) at the rate 2 kg/tree + chicken manure at the rate 15 kg/tree 8) chemical fertilizer 15-0-0 (NPK) at the rate 2 kg/tree + cow manure at the rate 25 kg/tree and 9) chemical fertilizer 15-0-0 (NPK) at the rate 2 kg/tree + chicken manure at the rate 15 kg/tree. The results showed that the number of days after treated to leaf flushing were not a significant difference. The percentage of leaf flushing after treated were significant difference ($P \leq 0.05$), the treatment 7 : chemical fertilizer 15-15-15 at the rate of 2 kg/tree + chicken manure at the rate 15 kg/tree was shown the highest percentage of leaf flushing by 85.80 percent and follow by treatment 6 : chemical fertilizer 15-15-15 at the rate 2 kg/tree + cow manure at the rate 25 kg/tree had been the percentage of leaf flushing by 83.00 percent, the untreated tree had the percentage of leaf flushing is the lowest by 33.40 percent. The number of days from leaf flushing to leaf maturing were significant difference ($P \leq 0.05$), treatment 7: chemical fertilizer 15-15-15 at the rate of 2 kg/tree + chicken manure at the rate of 15 kg/tree and treatment 9: chemical fertilizer 15-0-0 at the rate of 2 kg/tree + chicken manure at the rate of 15 kg/tree was shown the least number of days from leaf flushing to leaf maturing average 40.40 and 41.00 days, respectively. The untreated trees was showed the leaf flushing to leaf maturing is the longest number of days average 45.40 days. The number of times of leaf flushing of all treatments were not significant difference had been showed average 2-3 times

Keywords: chemical fertilizer, chicken manure, cow manure, durian

*Corresponding Author: Somporn Na Nakorn E-mail : nanakornsp@yahoo.com

Introduction

Durian (Scientific name : *Durio zibethinus* Murray; family: Bombacaceae; Genus: Durio) is one of the most important fruits grown in South-East Asia, is named as the “king of fruits” (Lee - Hoon Ho and Rajeev Bhat, 2015; Subhadrabandhu and Ketsa, 2001). Name “Durian” comes from the Malay-Indonesian language word “Duri”, meaning "thorn" (Botanical-online, 2015). Thailand is the world’s largest producer of durian, production and commercialization of durian fruits has strongly increased in the last three years (2012 2013 and 2014), producing 351,000 367,000 and 340,000 metric tons (MT), with exports recorded at 6,195 7,344 and 12,435 M Baht. An important export market mainly in China, Hong Kong, Taiwan and western countries (OAD, 2014). In Thailand since its value and export potential has been recognized just recently. One of the reasons for having this export potential is derived from the farmer’s have strongly producer which led to the different fruiting schedule of durian by off-season production in the countries. The one of off-season production is the technique of early inducing on the vegetative growth after harvesting. The manure and chemical fertilizer used for inducing vegetative growth in various methods.

The objectives of the study were assessed the effect of manure and chemical fertilizer on vegetative growth of off-season durian production.

Materials and methods

Plant materials

The experiment was conducted in the Mr. Prapan Dangprom orchard, located in the Krungching sub-district, Noppitum district, Nakhon Si Thammarat province, Thailand. Ten-year-old field-grown Durian trees were used in this study from January, 2014 to June, 2014. Plants under investigation were grown in the same location and were subject to rigorously similar cultural practices.

Treatments

A completely randomized design (CRD) with a total of 45 durian trees were used as experimental units where one tree represent a replicate of the different treatments. The treatments included of 9 treatments : 1) untreated trees 2) chemical fertilizer 15-15-15 (NPK) at the rate of 4 kg/tree 3) chemical fertilizer 15-0-0 (NPK) at the rate of 4 kg/tree 4) cow manure at the

rate of 50 kg/tree 5) chicken manure at the rate of 30 kg/tree 6) chemical fertilizer 15-15-15(NPK) at the rate of 2 kg/tree + cow manure at the rate of 25 kg/tree 7) chemical fertilizer 15-15-15 (NPK) at the rate of 2 kg/tree + chicken manure at the rate of 15 kg/tree 8) chemical fertilizer 15-0-0 (NPK) at the rate of 2 kg/tree +cow manure at the rate 25 kg/tree and 9) chemical fertilizer 15-0-0 (NPK) at the rate of 2 kg/tree + Chicken manure at the rate of 15 kg/tree.

Data recording and analysis

The data were collected of leaf flushing after applying fertilizer to flushing, percent of leaf flushing, time of leaf development after leaf flushing for leaf maturation and a number of leaf flushing. The data analysis was used program-R and treatment means were statistically compared using Duncan's Multiple Range Test (DMRT).

Results

Leaf flushing

The effect of manure and chemical fertilizer on the number of days after treating to leaf flushing had been the results showed that the number of days after treated to leaf flushing of all treatments were not significant difference (Table 1). Percentage of leaf flushing after treated were significant difference ($P \leq 0.05$), the treatment 7: chemical fertilizer 15-15-15 (NPK) at the rate of 2 kg + chicken manure at the rate of 15 kg was showed the highest percentage of leaf flushing by 85.80 percent and follow by treating 6: chemical fertilizer 15-15-15 (NPK) at the rate of 2 kg + cow manure at the rate of 25 kg had been the percentage of leaf flushing by 83.00 percent, the untreated tree had the percentage of leaf flushing is the lowest by 33.40 percent (Table 2).

Table 1. Effect of manure and chemical fertilizer used on the vegetative growth of durian tree.

Treatments	Number of days of leaf flushing after applying fertilizer (Days)	Percent leaf flushing (%)	Time of leaf development (after flushing to leaf maturing) (Days)	Number of leaves flushing (Times)
Control	10.20	33.40 ^e	45.40 ^a	2
15-15-15 = 4 kg	9.20	74.40 ^d	42.40 ^d	3
15-0-0 = 4 kg	9.60	49.40 ^e	43.40 ^c	3
Cow manure = 50 kg	10.20	37.60 ^f	44.60 ^b	2
Chicken manure=30 kg	9.80	47.20 ^e	43.40 ^c	3
15-15-15 = 2 kg+ Cow manure=25 kg	9.60	83.00 ^b	41.80 ^d	3
15-15-15 = 2 kg+ Chicken manure = 15 kg	9.20	85.80 ^a	40.40 ^e	3
15-0-0 = 2 kg+ Cow manure=25 kg	9.20	76.00 ^{dc}	42.40 ^d	3
15-0-0 = 2 kg+ Chicken manure = 15 kg	9.40	77.40 ^c	41.00 ^e	3
F-test	ns	*	*	ns
CV.(%)	7.03	13.35	11.30	12.00

Means with the same letter in each column are not significantly different ($p \leq 0.05$) tested by DMRT

Discussion

The chemical composition of the chicken manure and cow manure used in this study is presented in Table 2. The chicken manure and cow manure had properties consistent with N P K is difference in chicken manures was compared very well with values N P K obtained higher than cow manure, especially percent of N higher than cow manure one time. The soil analysis of total N, available P and available K properties in soil at the experimental site in January, 2014 to June, 2014, before start the experiment and after input the treatment. The result of soil analysis of total N, available P and available K before started the experiment of all treatments were showed the averaged of total N, available P and available K not significant difference, but, after treated with manure and chemical fertilizer at the difference rate was analyzed soil total N, available P and available K showed that the treatment 7 has total N the highest averaged 0.292 percent, otherwise, available P and available K are not significant difference (Table 3).

The result of this study showed that treatment with chemical fertilizer 15-15-15 (NPK) at the rate of 2 kg/tree plus chicken manure at the rate of 15 kg/tree was the best effected to percentage of leaf flushing after treated and the earliest number of days from the first time of leaf flushing to leaf maturing, because of chicken manure has properties consistent higher percent of total N, total P and total K than cow manure and also after treating found that soil total N, available P and available K has been higher than other treatments (Table 3). Similar to the reportage of Adejoro (2011), who found in poultry manure to increase growth and yield of *Corchorus olitorius*. In addition, application of different types of organic manures such as kraal manure and NPK fertilizer enhanced availability of soil nutrients and cation exchange capacity considerably in both acid soil and nutrient depleted soil.(Hamden and Fadni, 2010; Adeniyani, 2011).

Table 2. Some chemical properties of chicken manure and cow manure used in the study.

Sample for analysis	Percent of N P K		
	Total N	Total P	Total K
Chicken manure	2.21	0.94	1.81
Cow manure	1.23	0.74	0.89

Reference : Central Analytical Center, Faculty of Natural Resources,
Prince of Songkla University (26/08/2014)

Table 3. Soil analysis of N P K properties in soil at the experimental site in January, 2014 to June, 2014 before the start of the experiment and after input the treatment.

Treatment	Total nitrogen (before) %	Total nitrogen (after) %	Available phosphorus (before) (mg/kg)	Available phosphorus (after) (mg/kg)	Available potassium (before) (mg/kg)	Available potassium (after) (mg/kg)
Control	0.200	0.202 ^c	495.6	548.04	231.54	289.39
15-15-15 = 4 kg	0.206	0.248 ^{ab}	536.9	577.91	241.65	294.85
15-0-0 = 4 kg	0.208	0.232 ^b	421.8	537.30	280.02	286.38
Cow manure = 50 kg	0.202	0.254 ^{ab}	474.48	513.2	236.07	274.10
Chicken manure=30 kg	0.204	0.254 ^{ab}	485.20	557.7	239.86	295.70
15-15-15 = 2 kg+ Cow manure=25 kg	0.204	0.222 ^b	493.0	525.05	200.17	244.98
15-15-15 = 2 kg+ Chicken manure=15kg	0.202	0.292 ^a	477.1	530.34	238.01	268.38
15-0-0 = 2 kg+ Cow manure=25 kg	0.208	0.230 ^b	478.8	543.48	222.77	243.19
15-0-0 = 2 kg+ Chicken manure=15 kg	0.208	0.218 ^b	465.76	553.90	210.02	252.58
F-test	ns	*	ns	ns	ns	ns
CV.(%)	8.86	15.21	12.01	13.30	14.86	15.43

Means with the same letter in each column are not significantly different ($p \leq 0.05$) tested by DMRT

Conclusion

This study shows that the effect of manure and chemical fertilizer at the treatment 7: chemical fertilizer 15-15-15 (NPK) at the rate of 2 kg/tree + chicken manure at the rate of 15 kg/tree was shown the highest percentage of leaf flushing and the earliest of leaf maturing.

Acknowledgements

The authors are thankful to Mr. Prapan Dangprom the holder of Durian orchard for encouragement during the study. We gratefully acknowledge the financial support from the Nation Research Council of Thailand.

References

- Adejoro, S. A., Okunlola, A. I. and Fakanlu, G. (2011). Evaluation of Some Manure Types for the Growth and Yield of Watermelon in Southwestern Nigeria. *Researcher*, 3:393-395.
- Adeniyani, O. N., Ojo A. O., Akinbode, O. A. and Adediran J. A. (2011). Effect of Poultry Manure, NPK 15-15-15 and Combination of their Reduced Levels on Maize Growth and Soil Chemical Properties. *Journal of Soil Science and Environmental Management*, 2: 9-13.
- Benke, M.B., Indraratne, S.P., Hao, X., Chang, C., and Goh, T.B. (2009). Trace element changes in soil after long-term cattle manure applications. *J. Environ. Qual.* 37:798–807.
- Botanical-online . (2015). Durian (*Durio zibethinus*) . Available at : <http://www.botanical-online.com/english/durian-characteristics.htm>
- Hamden, M. I. K. and Fadni, O. E. (2010). Effect of Different Types of Organic Fertilizers on Growth, Quality and Yield of Tomatoes in Sandy Soil. Agriculture Research Corporation. Second RUFORUM Biennial Meeting 20-24 September 2010, Entebbe, Uganda.
- Lee-Hoon Ho and Rajeev Bhat. (2015). Exploring the potential nutraceutical values of durian (*Durio zibethinus* L.) An exotic tropical fruit. *Food Chemistry* 168 (2015) 80–89
- Manitoba Agriculture. (2013). Effects of Manure and Fertilizer on Soil Fertility and Soil Quality. [Online] <http://www.gov.mb.ca/agriculture/soilwater/soil/fbd04s00.html> [March 27, 2013].
- Office of Agricultural Economices (OAE). (2014). The export data of Durian (in Thai). Available at : http://www.oae.go.th/oae_report/export_import/export.php
- Subhadrabandhu, S., and Ketsa, S. (2001). Durian-king of tropical fruit. New Zealand: CABI Publishing
- Xingyang Liu, Guangxi Ren and Yan Shi. (2011). The effect of organic manure and chemical fertilizer on growth and development of *Stevia rebaudiana* Bertoni . [Online] <http://www.sciencedirect.com> [Energy Procedia (5) 2011 :1200-1204].