

Reduced Fertiliser Rounds Trial: Comparison between Compound and Mixture Fertilisers in High Rainfall Environment

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ABSTRACT

The choice of fertiliser recommended and applied in the oil palm estates has significant impact on the production of fresh fruit bunches (FFB). While it has been established that more application rounds at lower dosages is more efficient for nutrient uptake for the oil palms, it is not practical on the ground for the planters to be recommended with 7 to 8 rounds of fertiliser application annually. In most parts of Sabah where annual rainfall averages between 3500 mm to 4000 mm, it is even more challenging for estates to have high number of application rounds due to the shorter window (about 8 months) for fertiliser application and labour shortage constraints. Hence, incomplete fertiliser application can be detrimental to the oil palm yields in the long term. In this trial, Genting Plantations Berhad (GENP) evaluated a compound fertiliser regime at 4 application rounds against two mixture fertiliser regimes at 5 and 6 application rounds respectively. The trial started in 2011 and was conducted on 1998 planting with undulating to rolling terrain. Fertiliser applied at the trial site is based on best oil palm management practices and is fully supervised by the estate and research team. In terms of FFB yield, there is no significant difference between the compound fertiliser treatment and best performing mixture treatment (6 rounds application) after 48 months. No significant difference was also observed in the leaf nutrient levels between the compound and mixture fertiliser treatments. Comparison between the two mixture fertiliser treatments which were applied at 5 and 6 rounds respectively reaffirms previous research findings that the increase in frequency of application improves the fertiliser uptake efficiency as FFB yield for the mixture fertiliser treatment with 6 rounds application was 8% higher than the mixture fertilizer treatment with 5 rounds application. Between these two

treatments, average bunch weight (ABW) was higher by 6% and average bunch number was higher by 2%. Application of compound fertilizers at a reduced fertiliser rounds regime can produce similar FFB yields to mixture fertiliser regimes. The usage of compound fertilisers can address the issue of incomplete fertiliser application in areas of high rainfall which usually has less good months for fertiliser application.

ABSTRAK

Pilihan baja yang betul dan diaplikasi mengikut pengesyoran di ladang sawit mempunyai kesan yang signifikan ke atas hasil buah tandan segar (BTS). Walaupun telah diketahui bahawa lebih kerap pusingan pembajaan dengan dos yang lebih rendah membolehkan pokok sawit mengambil nutrien dengan lebih cekap, tetapi ianya tidak praktikal kepada pekebun untuk melakukan 7-8 pusingan pembajaan setiap tahun. Purata hujan tahunan antara 3500 mm hingga 4000 mm di kebanyakan tempat di Sabah, adalah cabaran bagi ladang-ladang untuk mempunyai bilangan pusingan pembajaan yang tinggi kerana kekangan masa aplikasi yang lebih pendek (kira-kira 8 bulan) dan juga kekurangan tenaga kerja. Oleh itu, aplikasi baja yang tidak lengkap boleh menjejaskan hasil sawit dalam jangka masa panjang. Dalam kajian ini, Genting Plantations Berhad (GENP) menilai rejim baja sebatian pada 4 pusingan pembajaan terhadap dua rejim baja campuran masing-masing pada 5 dan 6 pusingan pembajaan. Kajian bermula pada tahun 2011 dan telah dijalankan keatas pokok yang ditanam pada tahun 1998 di kawasan mukabumi tidak rata dan beralun. Pembajaan yang dilakukan berdasarkan kepada amalan pengurusan sawit terbaik dan diselia sepenuhnya oleh ladang tersebut dan sekumpulan penyelidik. Selepas 48 bulan, tiada perbezaan signifikan pada hasil BTS di antara rawatan baja sebatian dan baja campuran (6 pusingan pembajaan). Tiada perbezaan yang signifikan juga diperhatikan pada kandungan nutrien daun antara pokok yang dirawat dengan rawatan baja sebatian dan campuran. Perbandingan antara kedua-dua rawatan baja campuran yang telah digunakan masing-masing pada 5 dan 6 pusingan pembajaan menyokong

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penemuan penyelidikan sebelum ini bahawa aplikasi baja yang lebih kerap akan meningkatkan kecekapan pengambilan baja dan akan meningkatkan hasil BTS. Rawatan baja campuran dengan 6 pusingan pembajaan memperoleh hasil TBS 8% lebih tinggi daripada rawatan 5 pusingan pembajaan. Manakala, berat dan bilangan tandan adalah masing-masing 6% dan 2% lebih tinggi. Penggunaan baja sebatian dengan rejim pusingan pembajaan yang dikurangkan boleh memberikan hasil BTS yang sama dengan rejim baja campuran. Dengan itu penggunaan baja sebatian boleh menangani isu aplikasi baja yang tidak lengkap di kawasan yang menerima hujan yang tinggi yang biasanya mempunyai masa yang terhad untuk pembajaan.

Keywords: fertiliser, oil palm, FFB, application rounds, nutrient uptake, rainfall.

INTRODUCTION

At a high rainfall environment especially in most regions in Sabah, it is imperative that the fertiliser inputs to the oil palms are applied with quality and to be completed. For high rainfall regions in Sabah, there is only a window of eight months where the weather and rainfall are conducive for fertiliser application in Sabah. Coupling in with the current constraints on labour, it has always been a challenge for the estates to complete their annual fertiliser regime. It has already been well established that incomplete fertiliser application does not auger well for oil palm yields in the medium to long term. Compound fertilisers can come in granular forms and contain multiple nutrients that offer several advantages. Some of the methods used to produce compound fertiliser include compaction, accretion, pipe cross reactor and nitro-phosphate process. On the other hand, mixture fertilisers are basically formulation of two or more straight fertilisers when mixed together. With more fertiliser products in the market especially compound fertilisers, the oil palm industry are now provided with more options to alleviate the problem of incomplete fertiliser application albeit at a higher product cost. Hence, this trial was drawn up to compare the performance of compound fertilisers against mixture fertilisers in a high rainfall environment in one of the GENP estate in the Kinabatangan region.

MATERIALS AND METHODS

The trial was conducted on a 1998 planting of DxP oil palm planted on the Kretam soil association located in the Kinabatangan region of Sabah. The average rainfall of the trial location ranges from 3500 mm to 4000 mm annually. The compound

fertiliser treatment has 4 fertiliser application rounds per year while the mixture fertilizer treatment had 6 fertiliser application rounds per year. Normal maintenance rates of phosphate fertiliser were also applied to both treatments. The trial was designed based on randomised complete block design (RCBD) with four replicates per treatment. Each replicate comprised of 36 palms (6 x 6 palms) which serves as core assessment and recording palms. Fertiliser application was based on best management practices. Harvesting and recording of yield parameters such as average bunch weight (ABW) and bunch number were conducted at 10 days interval. Leaf and rachis sampling was carried out annually with one round of leaf and soil sampling carried out before the trial commenced. Upkeep and maintenance of the trial plots are as per GENP's best management practices.

RESULTS AND DISCUSSION

FFB Yield and Average Bunch Weight (ABW)

In terms of FFB yield, there is no significant difference between the compound and mixture fertiliser treatments from the first to fourth year. When the data was analysed cumulatively, there was also no significant difference between the two treatments with the FFB yield difference around 1 t ha⁻¹ over the course of four years. The nutrient composition for both the compound and mixture treatments was similar and the only difference between these treatments was the number of fertiliser application rounds, in which the compound regime was at 4 rounds and mixture regime at 6 rounds.

Average bunch weight (ABW) which is a key component in FFB yields was also not significantly different for both the compound and mixture treatments. The ABW increase in Year 4 compared to Year 1 for the compound and mixture treatments were 8% and 11% respectively but were not statistically significant.

Besides comparison of both compound and mixture fertiliser in terms of FFB yield, a mixture fertiliser regime at 5 rounds of application was also pitted against the mixture fertiliser regime at 6 rounds of application. The total dosage of fertilisers were similar with the 6 rounds application regime had a lower dosage per round. The 6 rounds mixture fertiliser treatment outperformed the 5 rounds mixture fertiliser treatment in all four years and was statistically significant. The cumulative difference between these two treatments over four years was more than 10 t ha⁻¹. This reaffirms previous research findings that more fertiliser

application rounds at lower dosages per round compared to less fertiliser application rounds.

Leaf and Rachis Nutrient Levels

Improvement in leaf K and leaf B were apparent in the 2014 leaf analysis when compared to the pretrial leaf analysis in 2011 and this was observed in both the compound and mixture fertiliser treatments. In the case of potassium (K), the improved levels observed in the leaf can be confirmed with the more than optimum levels tested in the rachis K (optimum rachis K > 1.20%). In terms of leaf N, the levels at the fourth year were more or less similar to the pretrial analysis levels but a drop in leaf P was noted in both the compound and mixture fertiliser regime.

CONCLUSION

The objectives of this trial were to compare both the compound and mixture fertilisers in a high rainfall environment in terms of FFB yields. It can be concluded that the use of compound fertilisers at reduced application rounds (4 rounds) is comparable with the use of mixture fertilisers at the conventional 6 rounds application as there were no significant difference in terms of FFB yields after

4 years. This information provides an additional option in streamlining and recommending fertiliser application regimes. For oil palm planting with higher rainfall and high rainfall months, compound fertilisers at lower number of application rounds can be recommended while for plantings with lesser or moderate annual rainfall, mixture fertilisers is still a viable option at lower dosage per round.

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REFERENCE

GERENDAS, J; UTOMO, B; MARTOYO, K; DONOUGH, C R and OBERTHUR, T (n.d.), Effect of Nutrient Application Frequency On Nutrient Uptake in Oil Palm Production on Sandy Soils.

TABLE 1. FFB YIELD - COMPOUND FERTILISERS *vs* MIXTURE FERTILISERS

Treatment	Year 1 (Jul 11 – Jun 12)	Year 2 (Jul 12 – Jun 13)	Year 3 (Jul 13 – Jun 14)	Year 4 (Jul 14 – Jun 15)	Cumulative (Jul 11 – Jun 15)
Compound	28.24a	32.87a	31.07a	31.36a	123.54a
Mixture	28.56a	33.44a	31.07a	30.81a	124.51a
Var. Ratio	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>

TABLE 2. AVERAGE BUNCH WEIGHT (ABW) - COMPOUND FERTILISERS *vs* MIXTURE FERTILISERS

Treatment	Year 1 (Jul 11 – Jun 12)	Year 2 (Jul 12 – Jun 13)	Year 3 (Jul 13 – Jun 14)	Year 4 (Jul 14 – Jun 15)	Cumulative (Jul 11 – Jun 15)
Compound	21.04a	22.18a	21.51a	22.71a	21.86a
Mixture	20.48a	22.00a	21.40a	22.73a	21.65a
Var. Ratio	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>	<i>ns</i>

TABLE 3. ANALYSIS RESULTS FOR LEAF N, P AND K & RACHIS K

Treatment	Leaf N		Leaf P		Leaf K		Rachis K		Leaf B	
	(%)		(%)		(%)		(%)		(ppm)	
	Year		Year		Year		Year		Year	
	2011	2014	2011	2014	2011	2014	2014	2011	2014	
Compound	2.51a	2.54a	0.169a	0.146a	0.92a	1.13a	1.63a	15a	21a	
Mixture	2.55a	2.53a	0.173a	0.146a	0.89a	1.12a	1.53a	15a	22a	
Var. Ratio	<i>ns</i>									

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