

FINAL REPORT

EVALUATION OF CONTROL RELEASE FERTILIZER NPK FOR RICE

FOR

EVERCHEM CORPORATION (M) SDN. BHD.

BY

UPMHOLDINGS

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Introduction

This project was carried to evaluate fertilizer Monotype 1 and Monotype 2 which are control release fertilizers provided by Everchem Corporation (M) SDN BHD. The study was conducted in a glasshouse at University Putra Malaysia (UPM).

Objective and experiments

Rice production relies heavily on fertilizers. Normally, nutrients uptake by plants is through their roots from the soil and/or the soil solution. Soil and plants, however, are two systems competing for the nutrients in the soil (AMBERGER, 1996). To increase the rice yield, high rates of fertilizers are applied by farmers which lead to serious environmental problem such as greenhouse effect. To reduce this excessive use of fertilizer, application of control release fertilizer has the potential to improve nutrient uptake efficiency. The use of these two NPK control released fertilizers can improve nutrient uptake by plant, and can increase plant yield as compared to normal fertilizer.

This study was carried out with these following objectives:

1. To evaluate the effectiveness of **Control Release Fertilizer NPK (Mono Type)** on rice yield.
2. To determine the effect of **Control Release Fertilizer NPK (Mono Type)** on NPK uptake by rice plant.
3. To determine the effect of **Control Release Fertilizer NPK (Mono Type)** on NPK content in soil.

Materials and Methods

Pot experiment

A pot study was conducted at University Putra Malaysia (UPM) glass house to determine the effect of control release NPK fertilizer (Mono Type) on plant uptake and yield of rice. The soil types used were obtained from Selangor and Kelantan rice fields. Thirty-two pots of size 0.0706m² were filled with 8kg soil. On 2nd June of 2012 MR219 rice seedlings were planted and were harvested on 14th September 2012. The trial was a randomized complete block design with 4 replications.

Fertilizer treatment

The fertilizer treatment consists of T1) Mono Type 1 (18:7:9), T2) Mono Type 2 (18:6:8), T3) NPK Normal rate (NAFAS) and 4) Control (No fertilizer added). The control release fertilizer was applied once in entire planting duration, the normal fertilizer was applied in 4-split application.

Plant growth and yield

Plant height and numbers of tillers were recorded. Plant height was taken at the length from the soil surface up to the longest tip of the leaf. The number of tillers was counted at flowering stage. An estimated chlorophyll levels was measured using chlorophyll meter (SPAD Minolta). Measurements of yield component were determined after harvest. Yield parameters consisted:

- i. Plant yield
- ii. Dry matter weight (plant tops)
- iii. Total NPK uptake by plant
- iv. NPK content in soil

Result and Discussion

The application of control release fertilizer Mono Type 1 and Mono Type 2 had significant effects on the tillers number, SPAD reading and panicle number for both Kelantan and Selangor soil (Table 1). The tillers number, plant height, SPAD reading and panicles number among the fertilizer treatments were not significant. All fertilizer treatments however, had significantly increased these parameters as compared to control.

Table 1: Effect of fertilizer types on tillers, plant height, SPAD reading and panicles of rice plants

Treatments	Tillers		Plant height		SPAD reading		Panicles	
	Kelantan	Selangor	Kelantan	Selangor	Kelantan	Selangor	Kelantan	Selangor
Monotype 1	16 a	20 a	102.5 a	114.5 a	33.3 ba	37.2 a	14 a	20 a
Monotype 2	16 a	18 a	100.5 a	117.75a	34.8 a	37.5 a	16 a	18 a
NAFAS	12a	17 a	101.7 a	116.5 a	34.8 a	37.3 a	13 a	17 a
Control	5 b	12 b	100.5 a	109.2 a	29.2 b	33.0 b	5 b	12 b

**Means with the same letter are not significantly different*

Table 2 shows the effect of different type fertilizer applications on yield of rice plant. Application of Mono Type 1 gave the highest grain yield in Selangor soil whereas application of Mono Type 2 gave the highest grain yield in Kelantan soil, similar trend was found in yield of straw. The data showed that total yield was influenced by fertilizer application. In spite of the differences found among fertilizer treatments and control, there was no significant difference between NAFAS fertilizer and Mono Type fertilizers in Selangor soil but application of Mono Type 2 significantly increased the total dry matter yield in Kelantan soil.

Table 2: Effect of fertilizes types on yield of rice plant

Treatments	Grain (g)		Straw (g)		Total Dry Matter (g)	
	Kelantan	Selangor	Kelantan	Selangor	Kelantan	Selangor
Monotype 1	12.55 ba	37.61 a	56.52 a	115.12 a	69.1 ba	152.70 a
Monotype 2	16.19 a	29.35 bc	60.56 a	85.92ba	76.75 a	115.28 ba
NAFAS	13.74 ba	32.40 ba	26.87 b	102.3 a	40.60bc	134.70 a
Control	4.49 b	22.22 c	14.92 b	55.06 b	19.41 c	77.3 b

**Means with the same letter are not significantly different*

The dry matters of plants were significantly affected by fertilizer application (Fig. 1). It can be observed that the highest dry matter in Kelantan soil was recorded in Mono Type 2 (60.55 g) whereas in Selangor soil the highest dry matter is Mono Type 1 (115.13 g).

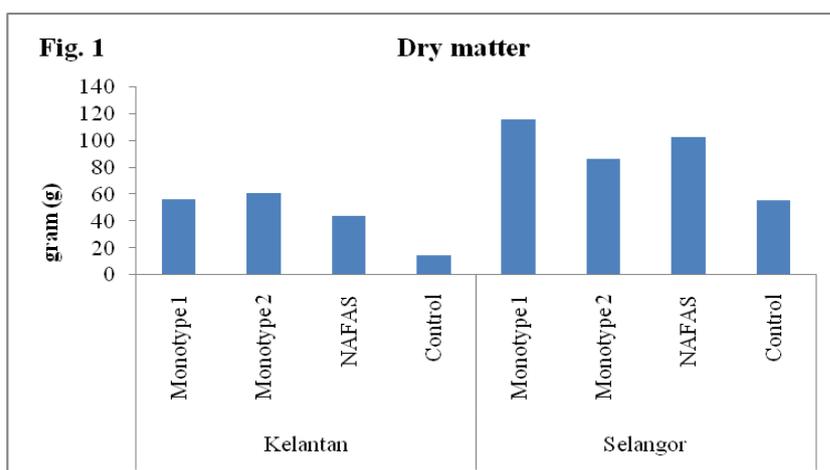


Fig. 1: Effect of fertilizer types on dry matter of rice plant

The total NPK concentration in soil showed in **Fig.2**, **Fig.3** and **Fig. 4**. NPK concentration in Kelantan soil was not significantly affected by fertilizer application. It was observed that N and P concentration in Selangor soil were significantly affected by application of Monotype fertilizers however it did not influenced the K concentration in the soil.

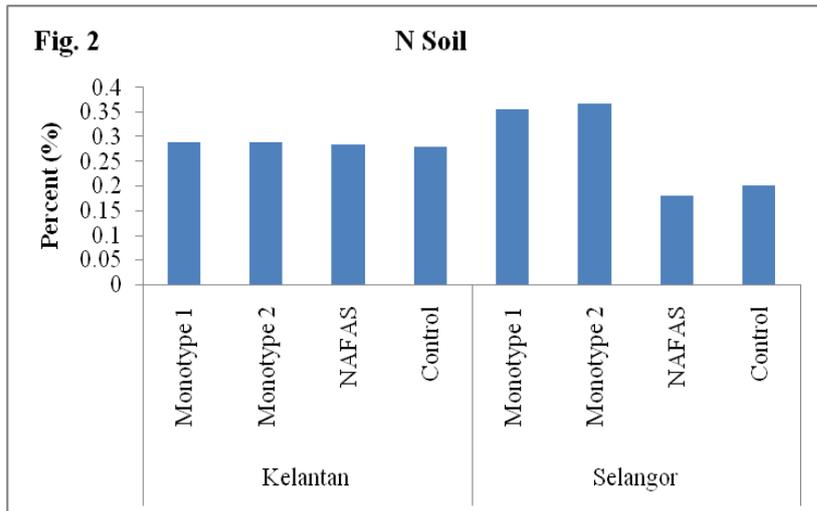


Fig. 2: Effect of fertilizer types on N concentration in soil

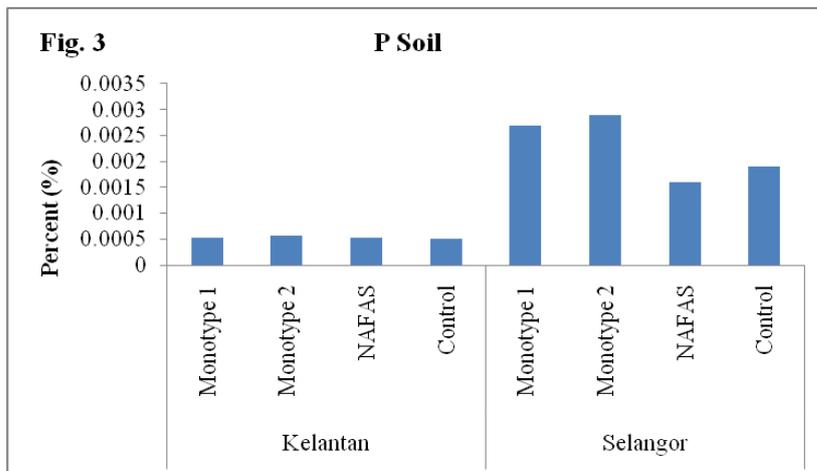


Fig. 3: Effect of fertilizer types on P concentration in soil

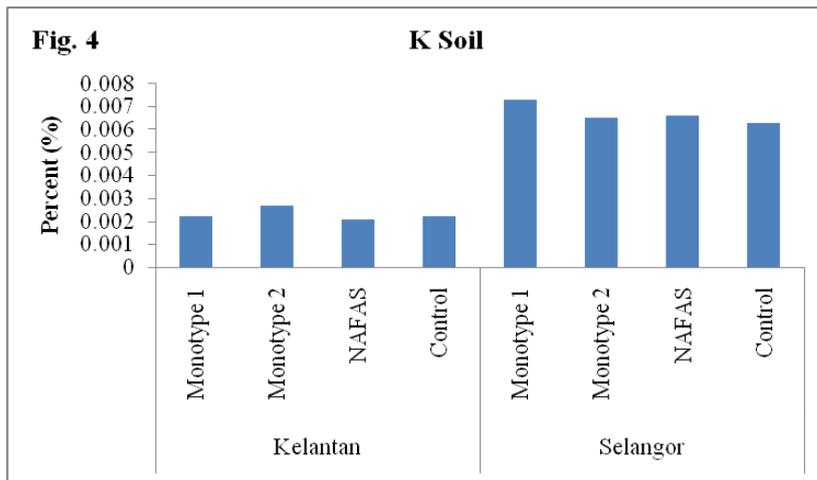


Fig. 4: Effect of fertilizer types on K concentration in soil

N concentration in tissue was significantly affected by Mono Type 1 application but it did not affect the P and K concentration in Kelantan soil (Fig. 5, 6 and 7). N and P concentration in Selangor soil was not affected by different type of fertilizer but it had significantly effects on K concentration.

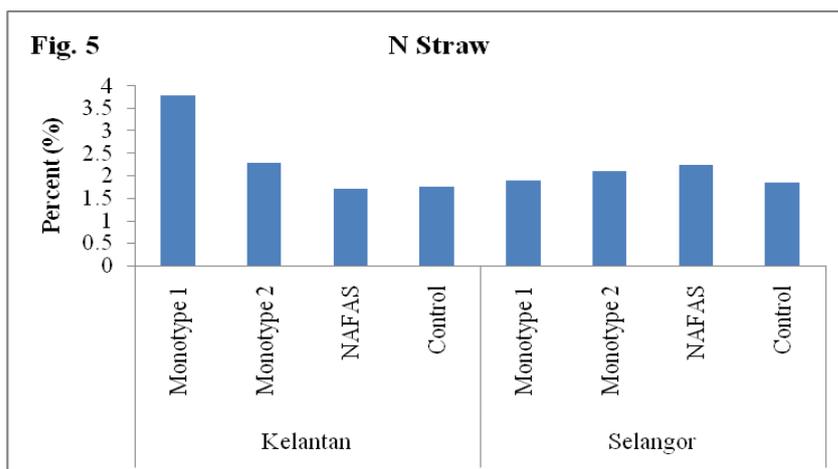


Fig. 5: Effect of fertilizer types on N concentration in rice straw

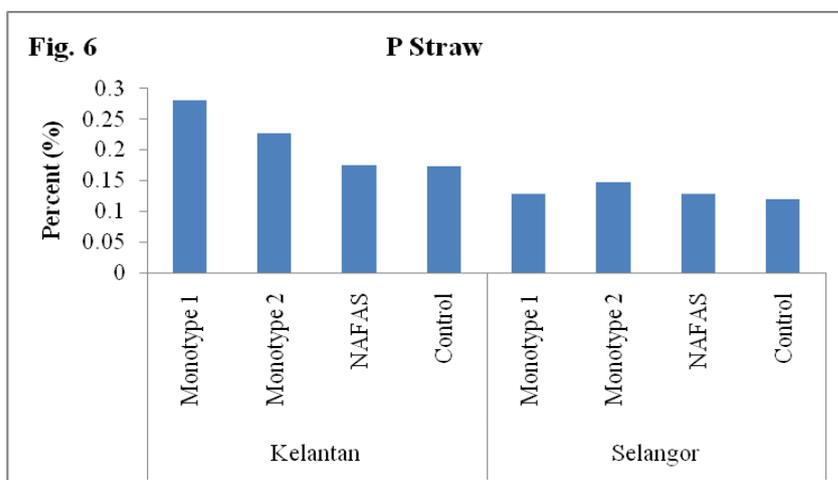


Fig. 6: Effect of fertilizer types on P concentration in rice straw

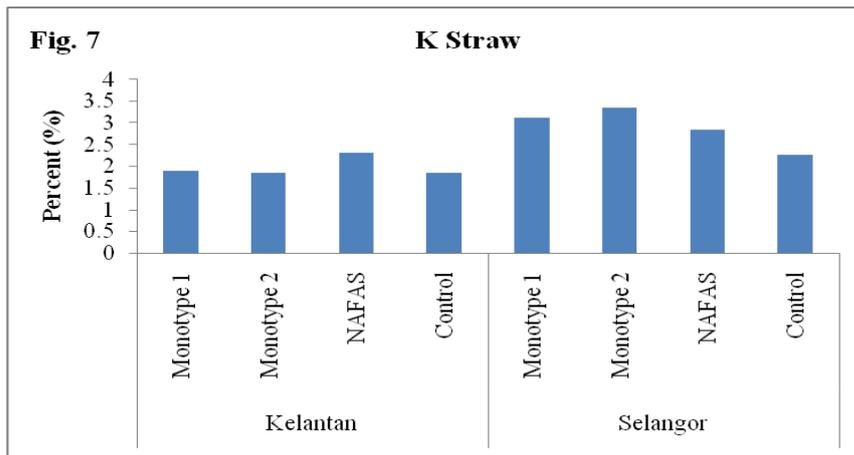


Fig. 7: Effect of fertilizer types on K concentration in rice straw

Fig. 8, 9 and 10 showed that N and K concentration in grain of Kelantan soil was not significantly affected by different of fertilizer applied. However it had significantly effects on P concentration. In selangor soil, it was observed that application of different type of fertilizers did not effects the NPK content in grain.

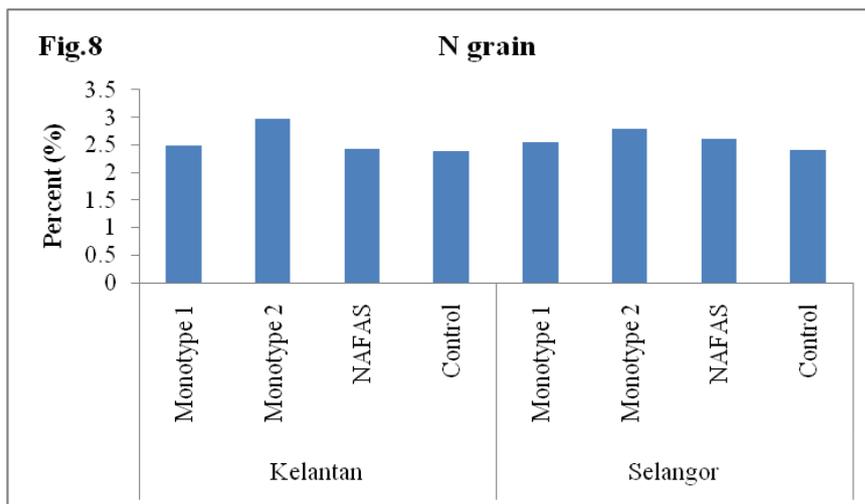


Fig. 8: Effect of fertilizer types on N concentration in rice grain

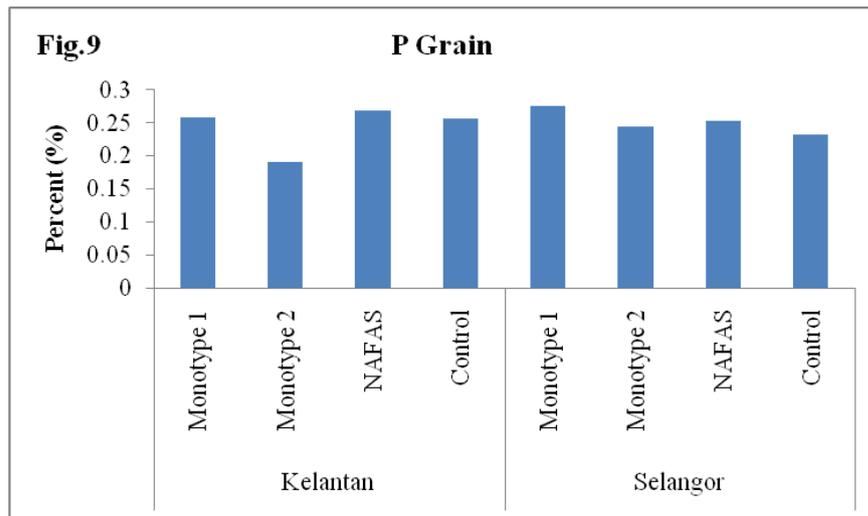


Fig. 9: Effect of fertilizer types on P concentration in rice grain

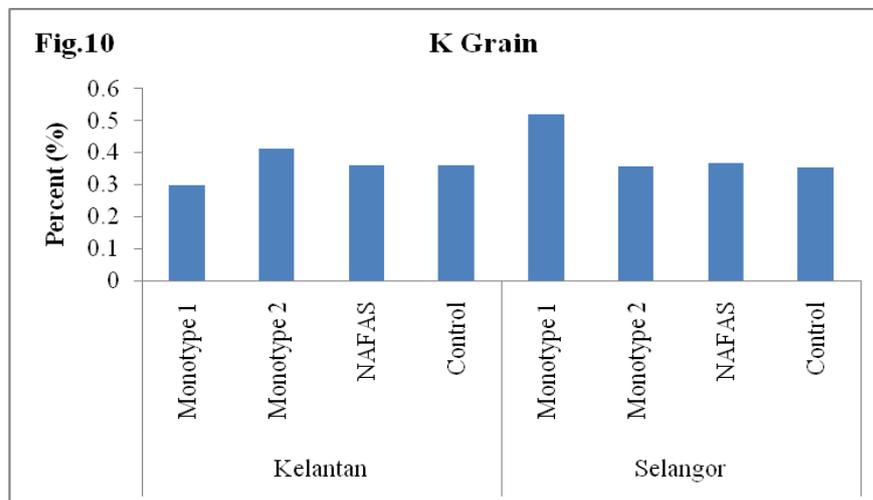


Fig. 10: Effect of fertilizer types on K concentration in rice grain

The total uptake of N in Kelantan soil was significantly affected by application of Mono Type 1 whereas total uptake of N in Selangor soil was not affected by any fertilizer applied (Table 3). Application of Mono Type 1 and 2 significantly effects the total uptake of P in Selangor soil. Data also showed that there was no significant effect in Kelantan soil. For total uptake of K, there was no significance difference between Mono Type fertilizers and NAFAS for both soils.

Table 3: Effect of fertilizer types on total NPK uptake (g/pot)

Treatments	Total uptake N		Total uptake P		Total uptake K	
	Kelantan	Selangor	Kelantan	Selangor	Kelantan	Selangor
Monotype 1	2.57 a	3.10 a	0.19 a	0.26 a	1.13 a	3.82 a
Monotype 2	1.90 ba	2.61 a	0.17 a	0.19 ba	1.19 a	3.22 a
NAFAS	0.78b	3.22 a	0.085 a	0.21 a	0.65 ba	2.94 a
Control	0.36b	1.55 a	0.053 a	0.12 b	0.31 b	1.32 b

*Means with the same letter are not significantly different

Conclusion

The pots applied with Mono Type fertilizer resulted in improving grain yield, tissue yield and total yield over pots with normal fertilizer. Generally, improvement in yield might be due to the increase of nutrient uptake by plants. Residual N and P at harvesting in the Selangor soils can be used by subsequent crop. In conclusion, our results indicate that application of control release fertilizer Mono Type can increase rice yield and can improve nutrients uptake.

References

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Appendix



Plate 1: Layout of pot experiment in the glasshouse



Plate 2: Fertilizer application



Plate 3: Rice plant at maturity