

GROWTH OF OIL PALM SEEDLINGS INFLUENCED BY NURSERY PRACTICES IN MALAYSIA AND INDONESIA

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INTRODUCTION

In 2011, the International Plant Nutrition Institute Southeast Asia Program (IPNI SEAP) initiated a 'BMP All Stages' project, with plantation partners in Malaysia and Indonesia, to assess the impact of best management practices (BMPs) during the three stages of the oil palm production cycle i.e. the nursery, immature, and mature stages. At each stage, BMPs specified by IPNI SEAP are compared to the standard estate practices (SEPs) of IPNI SEAP's project partners. Nursery activities commenced in 2011 in Sabah, Malaysia, and in 2012 in South Sumatra, Indonesia. As part of the ongoing evaluation, initial results of growth measurements from the nursery stage are presented

MATERIALS AND METHODS

At each location, planting materials are produced in nurseries to plant 5 sets (i.e. replicates) of commercial blocks (minimum 20 ha). Each set comprising 2 comparable blocks, one for BMP implementation following IPNI SEAP's specifications, the other managed using the SEP of the partner plantation. Dura x pisifera (DXP) hybrid seeds produced by each partner plantation are used at each respective location.

The double stage nursery method is used to produce 1-year old seedlings for field planting. 'Target' field planting months were chosen based on historical rainfall records to avoid a dry period after planting. Five rounds of pre-nursery (PN) and main nursery (MN) are done, i.e. one for each corresponding set of blocks in the field. In each round, half of the PN and MN is managed to BMPs specified by IPNI SEAP, the other half follows the project partner's SEP, for comparison.

In Sabah, key SEPs that differed from BMPs of IPNI SEAP are: (a) Use of plastic pot trays in the PN; (b) Use of organic material and mycorrhizal fungi inoculum in the PN and MN potting medium; (c) Use of organic-based fertilizers in PN and MN; and (d) Use of drip irrigation in the MN.

In South Sumatra, SEPs differed from IPNI SEAP's BMPs only in the fertilizer programs: (a) In the PN, the SEP program provided ca. 60% more nutrients from a higher number of applications; while (b) in the MN, the SEP program provided 23% more N, 2% more P, and 13% more K, but 33% less Mg. Most of the total P supplied was in acid-soluble form, whereas ca. 60% of total P supplied was water-soluble in the BMP program.

RESULTS AND DISCUSSION

(a) Growth in the pre-nursery (PN)

In Sabah, SEP PN seedlings were significantly larger than BMP PN seedlings for every parameter measured (Table 1). In South Sumatra, SEP PN seedlings were also larger, but differences were smaller. The advantages from using such trays are savings in space, soil, water use and labour (Chee *et al.*, 1997; Mathews *et al.*, 2010). Since pot trays were first used for raising oil palm PN seedlings (Chee *et al.*, 1997), other practices have been adapted (Mathews *et al.*, 2008), and the current SEP using pot trays in Sabah appears to be as good as the polybags in South Sumatra (Table 1).

(b) Fertilizer requirement in PN

For BMP PN in Sabah, there was no response to fertilizer rate (Table 2), i.e. nutrients from the seed kernel and the potting medium were sufficient to support growth. In South Sumatra, the BMP PN fertilizer rate was reduced from the start. With 60% less nutrients, growth of BMP PN seedlings in South Sumatra was only marginally poorer (Table 1), indicating that little fertilizer addition is needed at the PN stage. In SEP PN using pot trays in Sabah, there was a clear response to fertilizer rate (Table 2), the full rate giving the best result. Mathews *et al.* (2008) found that higher fertilization was needed for pot tray PN seedlings. Soil volume per pot was only 10% compared a conventional PN polybag, thus nutrients from added fertilizers and from POME mixed with the soil likely contributed to the good growth of SEP PN seedlings.

(c) Growth in the main nursery (MN)

In South Sumatra, BMP MN seedlings were better for all parameters measured (Table 3b), despite receiving 20% less N, 10% less K, and 50% less Mg. BMP MN seedlings received 2% less P, but 60% was in water-soluble form. Readily available P from the start likely resulted in the stronger early growth of the BMP MN seedlings. In Sabah, SEP MN seedlings had generally better growth than BMP MN seedlings (Table 3a). The opposite rankings of BMP and SEP at the two locations suggests that the Sabah SEP is an improvement over current conventional practices for oil palm nurseries.

CONCLUSION

Superior seedling growth with the unconventional practices used in Sabah indicates that current practices in oil palm nurseries need review. The 'BMP All Stages' project in Sabah was modified to separate nursery from immature stage effects.

Drip irrigation warrants further evaluation in terms of water and fertilizer use. Fertilizer practices (rate and source) influenced seedling growth. New measurements in the remaining nursery rounds will permit detailed analysis of nutrition effects in future reports from this project.

REFERENCES

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Project partners:



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TABLE 1. GROWTH¹ OF OIL PALM PRE-NURSERY SEEDLINGS IN SABAH (MALAYSIA) AND SOUTH SUMATRA (INDONESIA)

	BMP Sabah	SEP Sabah	BMP Sumatra	SEP Sumatra
Stem diameter (cm)	0.55	0.64	0.73	0.73
Plant height (cm)	23.18	26.98	23.87	26.50
No. of leaves (seedling ⁻¹)	3.21	3.68	3.53	3.67

¹ – Measured 13 weeks after seed sowing

TABLE 2. GROWTH¹ OF OIL PALM PRE-NURSERY SEEDLINGS WITH DIFFERENT RATES OF FERTILIZER IN SABAH (MALAYSIA)

	Fertilizer rate →	100%	50%	Zero
BMP	Stem diameter (cm)	0.54	0.52	0.58
	Plant height (cm)	22.31	21.56	23.27
	No. of leaves (plant ⁻¹)	3.08	3.15	3.00
SEP	Stem diameter (cm)	0.68	0.61	0.57
	Plant height (cm)	27.46	25.44	23.30
	No. of leaves (plant ⁻¹)	3.39	3.56	3.56

¹ – Measured 13 weeks after seed sowing

TABLE 3a. GROWTH OF OIL PALM MAIN NURSERY SEEDLINGS IN SABAH (MALAYSIA)

		12 WAT ¹	24 WAT ¹	36 WAT ¹
Stem diameter (cm)	BMP	2.23	5.15	8.19
	SEP	2.25	5.63	8.46
Plant height (cm)	BMP	41.95	79.20	129.18
	SEP	46.69	90.97	148.88
No. of leaves (plant ⁻¹)	BMP	7.80	12.63	15.90
	SEP	8.02	12.75	15.69
PCS ³ (cm ²)	BMP	0.17	0.69	1.51
	SEP	0.19	0.83	1.60

¹ – Weeks after transplanting; 2 – petiole cross section of leaf #3

TABLE 3b. GROWTH OF OIL PALM MAIN NURSERY SEEDLINGS IN SOUTH SUMATRA (INDONESIA)

		12 WAT ¹	24 WAT ¹	36 WAT ¹
Stem diameter (cm)	BMP	2.61	5.44	8.25
	SEP	2.35	4.95	7.97
Plant height (cm)	BMP	42.76	80.96	129.82
	SEP	38.08	74.56	123.54
No. of leaves (plant ⁻¹)	BMP	9.67	13.81	17.07
	SEP	8.97	13.22	17.02
PCS ³ (cm ²)	BMP	0.24	0.91	1.97
	SEP	0.19	0.89	1.89

¹ – Weeks after transplanting; 2 – petiole cross section of leaf #3

