

The beneficial effects of leguminous cover crops (LCC) and its use in oil palm plantation are commonly accepted. Besides improving soil fertility by fixing nitrogen and making it available to the main crop and reduce competition from noxious weeds, it also improves palm growth and reduces the immaturity period. In peat soil areas, the need for ground cover crop establishment becomes more crucial. The objectives of cover crops are to conserve soil moisture, minimise peat subsidence, prevent irreversible peat drying and reduce the risk of peat fire. LCC which have been successfully used as cover crops in oil palm plantations include *Pueraria javanica*, *P. phaseoloides*, *Centrosema pubescens*, *Calopogonium caeruleum* and *Calopogonium mucunoides*. However, these LCC are not commonly used on peat due to its poor growth performances. Research on the use of *Mucuna bracteata* as LCC on mineral soils shows satisfactory growth (Chua, *et al.*, 2007; Shaharudin and Jamaluddin, 2007; Mathews and Saw, 2007; Chiu and Siow, 2007). However, the performance of this LCC on peat soils has not been reported.

MATERIALS AND METHODS

The trial was initiated in 2007 at the MPOB Research Station in Teluk Intan, Perak. The area was a second generation oil palm cultivation with peat depths ranging from 150 to 200 cm. The trial was laid in a randomised complete block design (RCBD) of a split plot with four replicates (Table 1). The objectives of the study are to assess the performance of several types of LCC on peat in relation to ground cover management.

TABLE 1. GROUND COVER MANAGEMENT TREATMENTS

| Treatment | Species of cover crops | Note |
|-----------|---|--|
| C1 | Without cover crop | Control plot |
| C2 | <i>Pueraria javanica</i> + <i>Centrosema pubescens</i> + <i>Calopogonium caeruleum</i> + (conventional LCC) | 4:3:1 kg ha ⁻¹ (8 kg ha ⁻¹) |
| C3 | <i>Mucuna bracteata</i> | 320 seedlings ha ⁻¹ |
| C4 | <i>Mucuna bracteata</i> + <i>Pueraria javanica</i> + <i>Centrosema pubescens</i> | 320 seedlings ha ⁻¹ + 3:1 kg ha ⁻¹ |

Note: 5 g *Rhizobium* (RRI strain) per kg leguminous cover crops (LCC) seeds.



Figure 1. Conditions of immature and young mature oil palm on peat under poor ground cover management.

RESULTS AND DISCUSSION

Ground Coverage

As shown in Table 2, the initial establishment of conventional leguminous cover crops (C2) was faster compared to *Mucuna bracteata* (C3) as well as combination of *Mucuna bracteata* with *Pueraria javanica* and *Centrosema pubescens* (C4). At six months after planting, C2 plot recorded 80% ground coverage compared to C3 and C4 plots at 31% and 32% respectively. However, the ground coverage in the C2 plot showed a decreasing trend in which only 50% ground coverage were recorded at 12 months after planting onwards. On the other hand, C3 and C4 plots recorded about 60% ground coverage at 12 months after planting and increased up to 80% coverage at 24 months after planting.

Oil Palm Performance

Analysis of some oil palm vegetative growth parameters and fresh fruit bunches (FFB) yield from various ground covers management is shown in Table 3. Generally, the oil palm vegetative growth and FFB yield with ground covers (C2, C3 and C4) were significantly higher compared to without ground covers (C1). These results indicated that establishment of ground covers such as *Mucuna bracteata* on peat gave better early palm growth and yield.

TABLE 2. GROUND COVERAGE (%) OF DIFFERENT GROUND COVER MANAGEMENT

| Treatments* | Months after cover crop planting | | | |
|-------------|----------------------------------|-------------|-------------|------------|
| | 6 | 12 | 18 | 24 |
| C1 | 0.0 ± 0.0 | 0.0 ± 0.0 | 0.0 ± 0.0 | 0.0 ± 0.0 |
| C2 | 80.0 ± 0.0 | 54.2 ± 11.2 | 50.4 ± 5.8 | 55.4 ± 4.0 |
| C3 | 30.8 ± 5.1 | 57.9 ± 12.7 | 75.0 ± 10.2 | 77.5 ± 7.8 |
| C4 | 31.7 ± 3.9 | 66.7 ± 8.9 | 74.6 ± 6.0 | 80.8 ± 6.7 |

Note: values are mean ± standard deviations, where n = 12.

*Treatments as in Table 1.



Figure 2. Ground coverage of *Mucuna bracteata* after planting: (A) three months; (B) six months; (C) 12 months and (D) 24 months.

TABLE 3. EFFECTS OF GROUND COVERS MANAGEMENT ON OIL PALM PERFORMANCE

| Treatments* | Vegetative growth ¹ | | | FFB yield ² (t ha ⁻¹ yr ⁻¹) |
|---------------------|--------------------------------|---------------------|---|--|
| | Rachis length (cm) | Palm height (cm) | Petiole cross-section (cm ²) | |
| C1 | 393.5 b | 60.7 b | 0.167 b | 13.58 b |
| C2 | 402.5ab | 67.2ab | 0.183 a | 15.24 a |
| C3 | 409.7 a | 68.9 a | 0.179 a | 15.11ab |
| C4 | 415.1 a | 66.8ab | 0.177 a | 14.85ab |
| Mean | 405.2 | 65.9 | 0.176 | 14.69 |
| LSD _{0.05} | 12.2 | 6.7 | 0.009 | 1.46 |

Note: means within the same column with the same letter are not significantly different at p=0.05 (Duncan’s Test).

¹Palm age of four years after planting.

² Mean of first two years.

*Treatments as in Table 1.

CONCLUSION AND RECOMMENDATION

Mucuna bracteata was generally a slow starter but performed well under oil palm planting on peat.

It is recommended that establishment of *Mucuna bracteata* be adopted for oil palm planting on peat.

Establishment of *Mucuna bracteata*

| | |
|-------------------------|---|
| Seeds | Clipped seeds are raised in polybags (5 x 6 cm) filled with top soil. |
| Planting density | Six-week-old seedlings of <i>M. bracteata</i> are planted at density of two seedlings per oil palm planting point (320 seedlings ha ⁻¹). |
| Fertiliser applications | During the first month of planting, apply 40 kg ha ⁻¹ NPK 15:15:6:4 followed by 100 kg ha ⁻¹ rock phosphate at the second and third months after planting. No further fertiliser application is required after the third month. |
| Maintenance | During the first three months after planting, maintain weeding at 1 m around each seedlings of <i>M. bracteata</i> and thereafter, only eradication of woody plants. For the first year onwards, apply circle weeding monthly. |

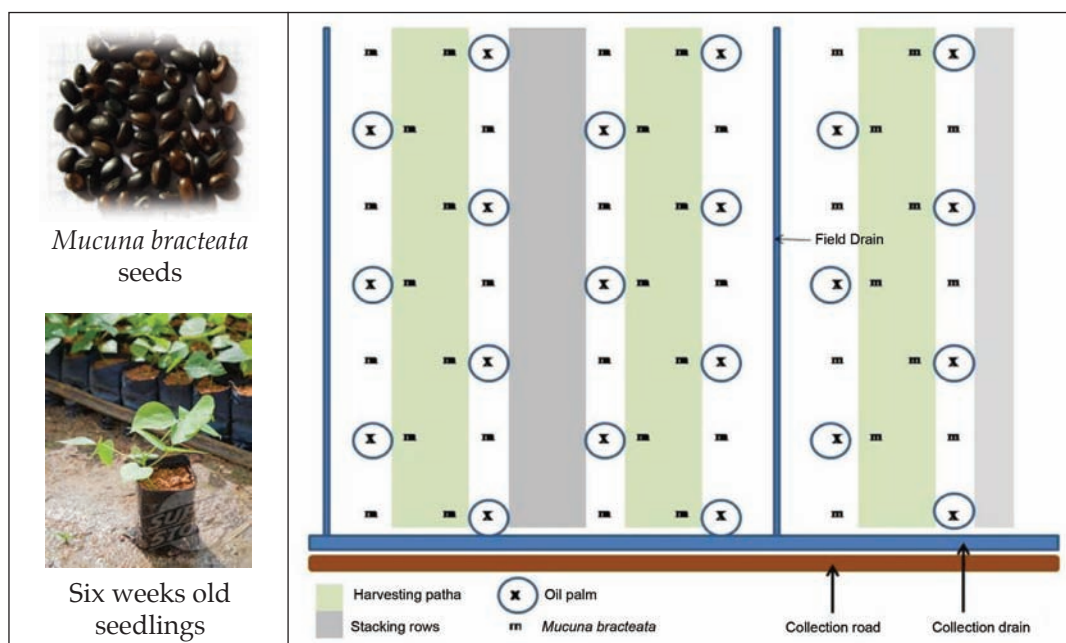


Figure 3. Planting pattern of *Mucuna bracteata* in peat soil areas.

Cost of *Mucuna bracteata* Establishment, 2012

| No. | Description | RM ha ⁻¹ |
|--------------|--|---------------------|
| 1 | Seeds 500 seeds ha ⁻¹ @ 60% seed germination rate RM 350 kg ⁻¹ seed @ 75 g seed ha ⁻¹ | 26 |
| 2 | Nursery (polybag, top soil, watering, etc.) 320 seedlings ha ⁻¹ @ RM 0.50 per seedling | 160 |
| 3 | Field preparation (blanket spraying) | 60 |
| 4 | Planting of seedling 320 seedlings ha ⁻¹ @ RM 0.40 per seedling | 128 |
| 5 | Manuring NPK 15:15:6:4 @ 40 kg ha ⁻¹ Rock phosphate @ 100 kg ha ⁻¹ x 2 rounds | 190 |
| Total | | 564 |

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