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INTRODUCTION

Acacia mangium

- Taxonomy
- Plantation – 1966
- 43,589 ha (SFD 2021)
- Vascular Wilt symptom
- Chlorosis → Wilting → Necrosis
- Mortality >50%
- SAFODA
- 1976; 1500 ha



Figure 1: View of one of SAFODA *A. mangium* plots



Figure 2 and 3: Infected *A. mangium* trees



Figure 4: Blue/black streak pattern



Figure 5: Defoliation and dead of *A. mangium* tree

METHODS AND MATERIALS

Study site

- SAFODA *Acacia mangium* plantation at Ulu Kukut (situated between districts of Kota Belud and Kota Marudu)
- site is less productive with its shallow, stony dystric cambisol
- Monsoon season is between October until March
- Mean annual rainfall is about 3500 mm.



Figure 6: Location of areas in SAFODA Ulu Kukut plantation

Survey area

- Survey was conducted in January 2020 by drive through to the plantation to observe trees with symptoms of wilting and dieback
- scientific information such as location, plantation size, genetic information of planting materials, silviculture regimes, elevation and harvesting rotation of the area were obtained prior to establishment of survey plots,
- SAFODA field staff involved were trained to familiarise the symptoms and other criteria of wilt such as discolouration, stem appearance and defoliation at site.
- There were seven plots established with trees age planted from year 2011 until 2017.
- Each age class plot consists of 100 trees with complete randomised block design.

Location	Plots	Year planted	Age (years)
Ulu Kukut	TI 1	2011	10
	SR 2A	2012	9
	SR 2B	2013	8
	TI 6	2014	7
	SR 5B	2015	6
	DU 7B	2016	5
	MGN 1A	2017	4

Table 1: Established survey plots

Disease assessment

- The disease assessment form was adopted from FRIM.
- Each individual tree was assessed based on the parameters such as crown discolouration, trunk condition- sunken bark, crack, stem wound and presence of foam, gummosis.
- Symptoms observed and recorded.

Symptom severity scores

- The assessment of disease severity was classified into six categories and given score of 0 (healthy) to 5 (dead tree)

METHODS AND MATERIALS

Score	Category
0	Healthy (No symptoms of wilt disease)
1	Light (Insect holes, wounds, crack and gummosis present)
2	Moderate (Insect holes, wounds, cracks, gummosis, canopy pale green and wilting)
3	Severe (Insect holes, wounds, crack, gummosis, sunken bark, canopy wilting and yellowing)
4	Very severe (Insect holes, wounds, crack, gummosis, sunken bark, canopy wilt and yellowing/browning of leaves, 30%-80% defoliation, thin canopy)
5	Dead (Wilt, 50%-100% defoliation and dead)

Table 2: Symptom severity score (FRIM)

$$\text{Disease Severity Index (DSI)} = \frac{[(0Na + 1Nb + 2Nc + 3Nd + 4Ne + 5Nf + \dots + XN_x) \times 100]}{Nt \times (Nf - 1)}$$

Where;

Na = no of trees in a plot with score 0

Nb = no of trees in a plot with score 1

Nc = no of trees in a plot with score 2

Nd = no of trees in a plot with score 3

Ne = no of trees in a plot with score 4

Nf = no of trees in a plot with score 5

Nt = total no of trees in a plot

Ni = no of disease category

Figure 7: Disease Severity index formula(FRIM)

RESULTS

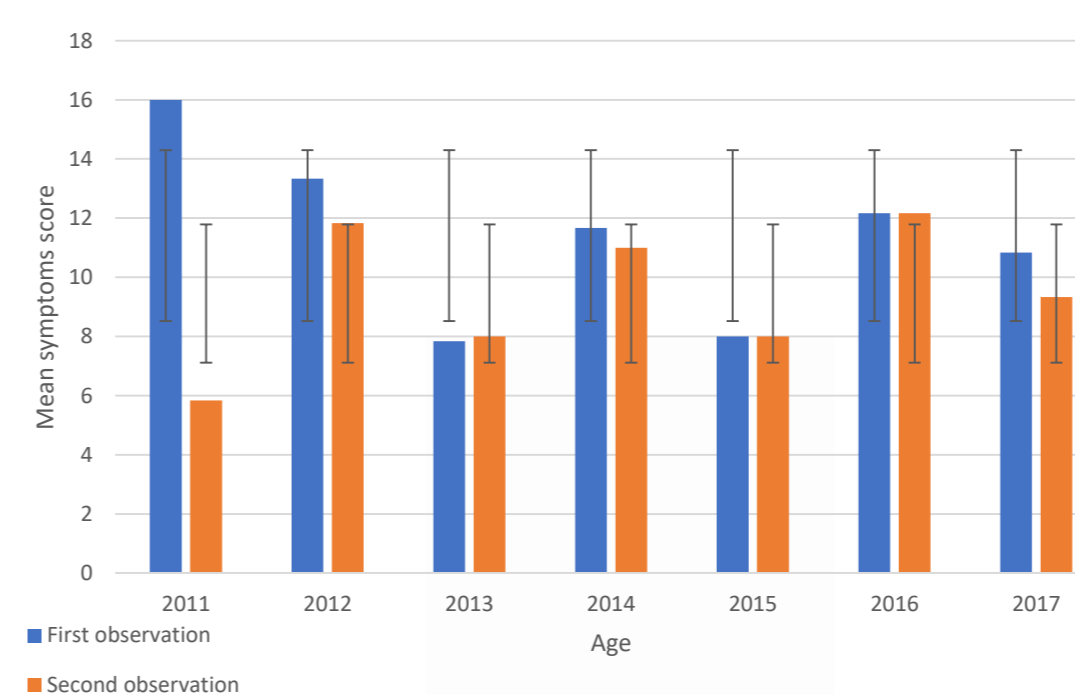


Figure 8: Mean symptom score of different age

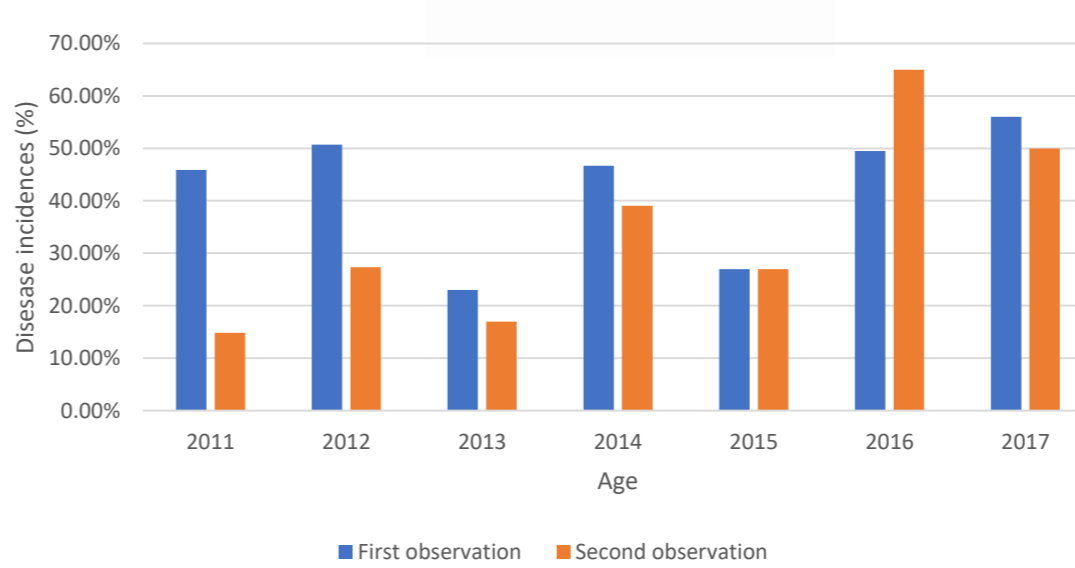


Figure 9: Disease incidence of different age

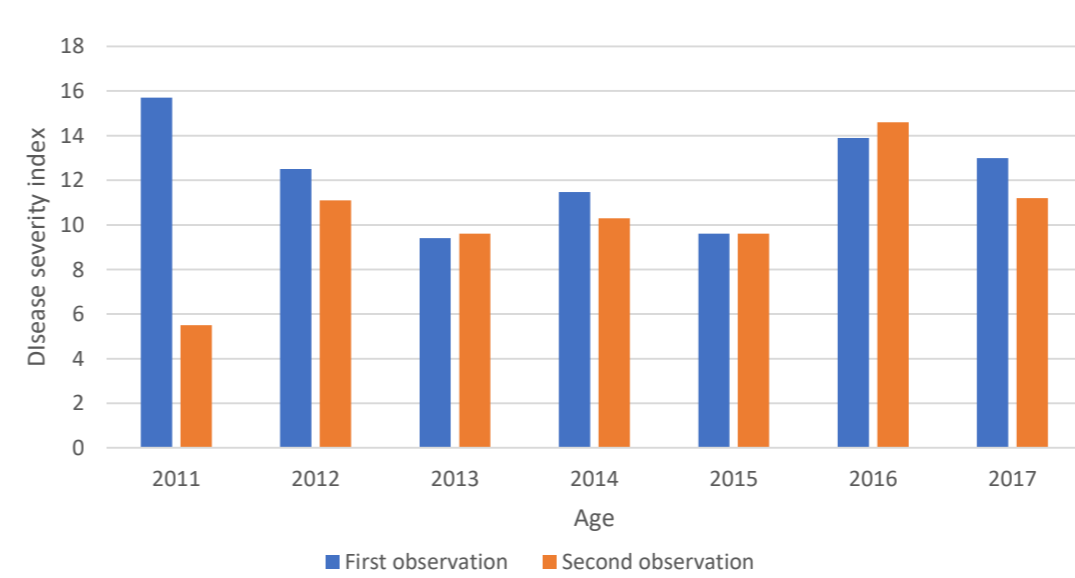


Figure 10: Disease severity index of different age

RESULTS

	First observation		Second observation	
	Disease incidences	Symptom severity index	Disease incidences	Symptom severity index
Age			0.808*	0.587*
p-value	0.196	-0.173	0.014	0.044

* Correlation is significant at the 0.05 level (1-tailed)

CONCLUSIONS

Study revealed high percentages of incidences of wilt on *Acacia mangium* trees planted in year 2016 and 2017. The disease severity index resulted high on the same two age classes. This suggested younger planted trees were more vulnerable with vascular wilt disease. Silvicultural management in SAFODA such as pruning practice induced wound for wilt disease pathogen to inhabit and spread the disease. Animals attack and human factors were also contributed to opening and increase the disease incidences.

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