

学位論文の要約

三重大学

所属	三重大学大学院生物資源学研究科 資源循環学専攻	氏名	CHUTIMANUKUL PREUK (チュチマヌクン・プルック)
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学位論文の題名: **Growth and Physiological Features of Sago Palm under Different Soil pH Conditions**

学位論文の要約 Sago palm (*Metroxylon sagu* Rottb.) is an extremely hardy plant that grows in swampy, acidic peat, submerged saline soils where almost no other major crops can grow without drainage or soil improvement and stores larger quantities of starch in its trunk. The sago starch can be processed into various basic raw materials for human and animal consumption as well as for use as an industrial energy source. Sago palm is expected to enhance agricultural production at lower productivity areas where are covered by problem soils. In soils with low pH, aluminum phytotoxicity is major problem on plant growth. Sago palm property such as aluminum tolerance is important to expand cultivation in areas of poor productivity or barren lands with sterile soil. In this study, the growth of sago palm seedlings under different soil pH levels in the experimental field level and the laboratory level experimental procedures was investigated.

Firstly, sago palm seedlings at the 6th leaf stage were transplanted in a Wagner pot filled with vermiculite. $AlCl_3 \cdot 6H_2O$ was added into Kimura B culture solution to be 140 ppm. The pH value of the culture solution was adjusted to 3.5, 5.7 and 7.9 with 3 replications. The Al^{3+} concentration in culture solution was different depend on pH of soil solution which was highest at pH 3.5 followed by pH 5.7 and pH 7.9. The growth of sago palm was not significantly different among the three pH treatments in the plant height, plant length, leaf number, leaflet number, emerged leaf number, green leaf number, dead leaf number and total leaflet area. The root weight was large at higher pH condition, while there was no significant difference in the total weight.

Secondly, sago palm seedlings at the 6th leaf stage were transplanted in a Wagner pot filled with vermiculite. Three levels of aluminum concentration ($AlCl_3 \cdot 6H_2O$) were added into Kimura B culture solution: 0, 150 and 300 ppm with 3 replications. Culture media pH in all the plots was adjusted to 3.5. The relative growth rate (RGR) and net assimilation rate (NAR) for 8 weeks tended to be slightly decreased with Al treatments (150, 300 ppm Al). The deficiency of nutrients was found under Al stress such as lower P, Ca^{2+} and Mg^{2+} concentration in plant. In addition, the relationships between root growth parameters and Al stress were apparent. High Al concentration inhibited root growth through the decreasing of root cell number per unit cortex area and adventitious root diameter.

Thirdly, the 2 plots were placed at the experimental farm, Faculty of Agriculture, Halu Oleo University, Kendari, Indonesia. In each plot, 16 young sago palm seedlings were transplanted. In the native acid soil plot (control: pH4.9) and the calcium application plot, 3kg calcium carbonate ($CaCO_3$) was applied prior to the transplanting and 6 months after. The growth in plant height, plant length, leaflet number per leaf, dead leaf number per plant, and dry matter weight of each part for 6 months after transplanting was almost same in the control and calcium application plots. The results of growth analysis for 6 months, there were no remarkable differences between the control and calcium application plots. Growth parameters at 10 months after transplanting, there were no apparent differences in plant height, plant length, leaf number per plant, leaf number per leaf and dead leaf number between the control and calcium application plots. Sago palm grew preferably under lower soil pH condition even compared with that in soil condition applied additional calcium in case of soils that have the same parent material. Moreover, the difference in dry matter weight tended to be different from plant part to part.

From these results, it was concluded that (1) higher Al concentrations at over 150 ppm in growth media retarded the relative growth rate of individual sago palm through hindered net assimilation rate; (2) the depression of dry matter growth with higher Al concentrations was apparent in the root part, which might attribute to prevented cell division in cortex of the root; (3) the effect of higher Al concentrations in growth media on morphogenesis of top part was not remarkable; (4) sago palm showed preferable growth under lower soil pH compared with that in calcium applied soil that have the same parent material.