SOME ASPECTS OF ECO-PHYSIOLOGICAL ADAPTABILITY OF THREE LEGUMINOUS CREEPING COVER SPECIES

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ABSTRACT

Eco-physiological adaptability of three creeping legume cover species, Mucuna utilis Adans, Macroptilium atropurpureum (DC) Urb. and Pueraria phaseoloides Benth were studied under coconut, and under artificial shade.

Adaptability of legume species to shade in diverse soil and climatic conditions was evaluated in Wet, Intermediate and Dry zones with soil types, Ultisols and Entisols under coconut. Seedlings of M. utilis and M. atropurpureum emerged and covered ground rapidly, smothering weeds effectively in all locations while P. phaseoloides had a reduced seedling emergence, particularly in early stages. Germination response to temperature was also higher in M. utilis and M. atropurpureum than in P.phaseoloides. In the Dry zone, M. utilis and M. atropurpureum produced higher above ground dry matter (DM) and leaf litter yields while in the Intermediate zone, M. atropurpurem and P. phaseoloides produced more. In the Wet zone, P. phaseoloides was superior to others in DM and leaf litter production.

Shade induced a marked reduction in N fixation of three species. Nitrogen fixing capacity of P. phaseoloides was highest in all shade levels although it had a greater reduction in heavy shade (70%). Reduction in N fixation with increased shade was moderate in M. atropurpureum while M. utilis had the least reduction in heavy shade. N translocated from nodules to other parts was highest with P. phaseoloides at three months after planting (MAP), however, later all species had around 96-98% translocation. A strong positive correlation existed between total plant N and dry weights of plant parts of species, irrespective of shade levels.

Shade and defoliation markedly depressed nodulation and regrowth after defoliation of legume species. Nodule loss and reduction in initial Total Soluble Carbohydrate (TSC) content of shoots and roots in all species was greater with more severe defoliation and were adversely affected when photosynthetically active leaves were removed than when older less active leaves were removed. M. utilis reacted adversely to defoliation, particularly for cutting and removal of all leaves, while P. phaseoloides had a moderate response and M. atropurpureum the least

affected under shade. Rate of regrowth after defoliation was greatly influenced by initial TSC content in shoots and roots of species, and to a lesser extent by residual leaf area.

Mixing ability of three species with Centrosema pubescens Benth varied under shade. Shading reduced the shoot and root dry weights, specific leaf weights and transpiration rate, and increased Stomatal Diffusive Resistance of species in mixtures. Drought tolerance of species was in the descending order of C. pubescens > M. utilis > M. atropurpureum > P. phaseoloides. In all shade levels. M. atropurpureum and P. phaseoloides had compatible mixtures with C. pubescens, throughout growth period, while M. utilis mixed well only after one year.

Based on overall results, M. atropurpureum with its moderate shade tolerance and drought tolerance can be recommended for young (upto 5 years) and mature (above 30 years) plantations on Regosols or Ultisols of Dry and Intermediate zones, while P. phaseoloides would be suitable for all coconut plantations on Ultisols of Intermediate and Wet zones. M. utilis with greater drought tolerance and shade tolerance would be preferred for coconut plantations with heavy shade in the Dry and Intermediate zones. However, its greater sensitivity for management practices and low mixing ability with other covers entails further testing of its suitability under coconut.