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Influence of low light intensity on growth and yield of four soybean cultivars during wet and dry seasons of northeast thailand

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ABSTRACT

Crop is commonly grown in intercrop combinations of which cereal/legumes are the most widespread in tropical countries. The availability of low light inten-sity due to shading is the critical factor in determin-ing legume yield in intercropping. The experiment searches of better soybean cultivar for intercropping. A field experiment was conducted at the experimen-tal farm of Khon Kaen University in 2005. The objec-tives of this study were to determine the influence of light regimes (30% of normal light, 50% of normal light and normal light) on the growth and yield of four soybean cultivars (early, medium and late ma-turity) under artificial shading at 35 days after seed-ing until harvest in the wet and dry seasons. The re-sults showed that grain yield was significantly ($p<0.05$) decreased under the low light intensity at 30% of natural light both in wet and dry season. This was mainly due to low light intensity at 30% of natural light decreasing the number of pods per plant in the dry season. For cultivars, grain yield was sig-nificantly difference ($p<0.05$) among cultivars both in the wet and dry seasons. The cultivar KKU 74 (me-dium maturity) gave maximum grain yield both in wet and dry season under the low light at 30% of natural light. The KKU74 cultivar is better adapted to shading environment than other cultivars. This was due to the KKU74 cultivar produced higher chlorophyll b concentration in leaves after the plant experienced to shading. This physiological character can be used for soybean breeding program in shading tolerance. Therefore, the cultivar KKU 74 had a higher potential yield advantage in intercropping systems in which low light intensity is a major limit-ing factor on grain yield.

KEYWORDS

Chlorophyll Concentration; Shading; Soybean

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References

[1] Roy, R.P., Sharam, H.M. and Thakur, H.C. (1981) Studies on intercropping in long-duration pigeonpea on sandy loam soil of North Bihar. Indian Journal of Agronomy, 26(1), 72-82.

[2] Faris, M.H., Burity, H.A., Reis, D.V.D. and Mafra, R.C. (1983) Economic analysis of bean and maize system in monoculture vs. associated cropping. Field Crop Research, 1, 319-335.

[3] Huges, H. D. and Metcalfe, D.S. (1972) Crop production 3rd Ed. Macmillan Publishing. New York.

[4] Odango, J.C.W., Veresoglo, D.S. and Sfica, A.G. (1990) Effects of population density, nitrogen fertilization and inoculation of the yield of intercropped maize and soybean. Field Crop Abstract, pp. 043-055619.

[5] Hayder, G., Mum-raz, S. S., Khan, A. and Khan, S. (2003) Maize and soybean intercropping under various levels of soybean seed rates. Asian Journal of Plant Sciences, 2(3), 339-341.

[6] Ahmed, S. and Rao, M. R. (1982) Performance of maize-soybean intercrop combinations in the

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tropics: Results of a multi-location study. Field Crop Research, 5, 147-161.

[7] Nizamani, M.I.F. (1986) Yield performance of maize intercropping system with soybean under various fertility levels. M. Sc. Thesis. S.A.U. Tandojam, Pakistan.

[8] Panhwar, M.A., Mempn, F.H., Kalhoro, M.A. and Somro, M.I. (2004) Performance of maize in intercropping system with soybean under different planting patterns and ni-trogen levels. Journal of Applied Science, 4(2), 201-204.

[9] Polthanee, A. and Changsri, R. (1999) Effect of planting dates of mungbean on growth and yield in corn mung-bean relay cropping under rainfed conditions in an upland area of Northeastern Thailand. Thai Journal of Agricultural Sci-ence, 32(2), 187-196.

[10] Polthanee, A. and Treloges, V. (2002) Growth and yield of mungbean cultivars in mung-bean-corn relay intercropping systems. Journal of International Society for Southeast Asian Agricultural Sciences, 8(2), 1-14.

[11] Polthanee, A. and Treloges, V. (2003) Growth, yield and land use efficiency of corn and legumes grown under intercropping systems. Plant Production Science, 6(2), 139-146.

[12] Kakiuchi, J. and Kobata, T. (2004) Shading and thinning effects on seed and shoot dry matter increase in de-terminate soybean during the seed-filling period. Agronomy Journal, 96, 398-405.

[13] Kakiuchi, J. and Kobata, T. (2006) The relationship between dry matter increase of seed and shoot during the seed-filling period in three kinds of soybeans with different growth habits subjected to shading and thinning. Plant Production Science, 9(1), 20-27.

[14] Department of Agriculture, Ministry of Agriculture and Cooperative Recom-mendation (2001) Good agricultural practice for soybean. Ag-ricultural Cooperative Publishing, Bangkok.

[15] Moran, R. (1981) Formulae for determination of chlorophyll pigments extracted with N, N-Dimethyl formide. Plant Physiology, 69, 1376-1381.

[16] Singh, L. (1988) Adaptation and yield of potato under low light intensity. Indian Journal of Plant Physi-ology, 31, 114-116.

[17] Naidu, C. V. and Swamu, P. M. (1993) Effect of shade on growth, biomass production and associated physiological parameters in Pongamia Pinnata (Linn.) Pierre. Indian Journal of Plant Physiology, 37 (4), 212-214.

[18] Jadhav, B.B. (1987) Effect of partial shading on the yield of rice. Indian Journal of Agricultural Science, 57(7), 515-516.

[19] Saito, M. and Kato, T. (1994) Effects of low temperature and shade on relationships between nodulation vesicular-arbuscular mycorrhizal infection, and shoot growth of soybean. Biology and Fertility of Soil, 17, 206-211.

[20] Singh, V.P., Dey, S.K. and Murthy, K.S. (1988) Effect of low light stress on growth and yield of rice. Indian Journal of Plant Physiology, 31, 84-91.

[21] Kurosaki, H. and Yumoto, S. (2003) Effects of low temperature and shading during flowering on the yield components in soybeans. Plant Production Science, 6(1), 17-23.

[22] Egli, D.B. (1977) Cultivar maturity and response of soybean to shade stress dur-ing seed filling. Field Crops Research, 52, 1-8.

[23] Muthuchelian, K., Paliwan, K. and Gnanam, A. (1989) Influence of shading on net photosynthesis and transpi-ration rates, stomatal diffusive resistance, nitrate reductase and biomass productivity of a woody legume tree species. The Proceedings of the Indian Academy of Sciences, 99, 539-546.

[24] Boardman, N. K. (1977) Comparing photosyn-thesis of sun and shade plants. Annual Review of Plant Physiology, 28, 355-377.

[25] Usuda, H., Ku, S. B. M. and Edwards, G.E. (1985) Influence of light intensity during growth on photosynthesis and activity of several key photo-synthetic enzymes in a C4 plant (Zea mays). Physiologia Plan-tarum, 63, 65-67.

[26] Barker, J. (1985) Thylakoid membrane structure and organization of electron transport components. In: J. Barker and R. Baker (Eds.) Photosynthetic Mechanisms and the Environment. Elsevier. Amsterdam. pp. 91-134.

[27] Zhao, D. and Oosterhuis, D. (1998) Cotton responses to shade at different growth stages: Nonstructural carbohydrate composi-tion. Crop Science, 38, 1196-1203.

[28] Hale, M.G. and Orcutt, M.M. (1987) Irradiation stress. In : M.G. Hale and D.M. Orcutt (Eds.) The Physiology of Plants Under Stress. John Wiley and Sons, New York. pp. 109-115.