

学 位 論 文 要 旨	
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題 目	Study on Flooded Cultivation of Taro ( <i>Colocasia esculenta</i> (L.) Schott) (サトイモの湛水栽培に関する研究)
<p>Taro is commonly cultivated in upland fields. However, the ‘Taimo’ cultivar in the Nansei Islands and the ‘Binroushin’ cultivar in Taiwan are cultivated in flooded conditions. Therefore, we considered the potential for taro cultivation in flooded conditions.</p> <p>The effects of flooding on the growth of taro in pot culture were studied. Under flooded conditions, the upland cultivars ‘Daikichi’, ‘Yamato’, ‘Eguimo’, ‘Sennannakanowase’, and ‘Ishikawawasemaru’ were able to grow as well as the lowland cultivar ‘Taimo’. The petioles of these five upland cultivars elongated to 1.1–1.9 times those of the control. Indeed, the yields of mother and daughter tubers of the upland cultivars had increased to 1.4–2.3 times those of the control. These results suggest that these upland cultivars were able to grow well and showed improved yield under flooding conditions; the growth and yield were equivalent to that of the lowland cultivar ‘Taimo’.</p> <p>We next studied the effect of flooding on photosynthesis in the cultivars. In comparison with upland field conditions, growth under flooded conditions led to an increase in the photosynthesis rate in ‘Daikichi’, ‘Yamato’, ‘Eguimo’, and ‘Sennannakanowase’, as well as ‘Taimo’. The observed increase in yield under flooded conditions in these cultivars has been speculated to be due to the increase in photosynthetic rate, since the corm yield of these cultivars is closely related to the amount of photosynthetic products. The photosynthetic rate is governed by stomatal and mesophyll conductance, both of which were increased under flooded conditions. Stomatal conductance is governed by stomatal density, size, and aperture. Although stomatal density and size were not affected by flooded conditions, an increase in stomatal aperture led to increased stomatal conductance under flooded conditions. Mesophyll conductance is a reflection of the photosynthetic enzyme and photosystem activity. Under flooding conditions, the content of chlorophyll, the major component of the photochemical system, increased, suggesting high photosystem activity. In upland cultivation, the leaf surface temperature is over 40°C in periods of high temperature and high sunshine, leading to a reduction in photosynthetic enzyme and photochemical system activity. Owing to transpiration, the leaf surface temperature is 3.4–7.4°C lower under flooded conditions than that in upland cultivation. Therefore, the reduction in the photosynthetic enzyme and photochemical system activities is suppressed, and mesophyll conductance increases.</p> <p>The increase in photosynthetic rate was not significant for ‘Ishikawawasemaru’. Therefore, we believe that the improved yield in this variety is due to factors other than the photosynthetic rate, which require further study.</p> <p>As described above, we revealed that upland cultivars of taro were able to grow as well as the lowland cultivars under flooded conditions, and this new cultivation method could improve the yield. Paddy fields play multifunctional roles, including conservation of national land (flood and landslide prevention), water resources, and the natural environment. There is a possibility that cultivation of taro might help to maintain these multifunctional roles. These results are expected to significantly contribute to agricultural production in the future.</p>	