

Radiation Capture and Use as Affected by Morphologically Contrasting Maize/Pea in Sole and Intercropping

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Abstract

Field experiments were conducted at the Field Unit of the School of Plant Sciences in Reading, UK, during the 2000 and 2001 growing seasons to compare the radiation capture and use efficiency of morphologically and physiologically contrasting maize/pea intercrops with sole crops. The maize cultivars comprised Nancis with erect and Sophy with floppy leaves whilst the peas consisted of Maro, a conventional leaved, and Princess, a semi-leafless cultivar. Radiation capture by the sole and intercrops was measured using a Sunflekt Ceptometer (Delta T Devices), with a sensor length of 80 cm. Measurements were taken at four equidistant positions in each plot, 1 m away from the edges of the plot. Before the maize grew above the peas, measurements were taken at the top of the canopy and below. When the canopies were distinct, three measurements were taken, above the canopy, above peas and below the canopy from 9.30 a.m. to 1.00 p.m. at weekly intervals. In both seasons the intercrops and sole pea crops intercepted more radiation compared to the sole maize crops. Towards the end of the season the intercrops and sole maize had similar interception. Intercropping both maize cultivars in 2000 with the conventional pea had the greatest interception in 2001. Radiation use efficiency (RUE) was measured by taking the respective changes in above ground dry weight and dividing by the respective changes in cumulative absorbed photosynthetic active radiation (PAR). The RUE were highest at mid-season for both intercrops and sole crops in both seasons. Comparisons were also made using cumulative radiation use efficiencies (CRUE), representing the RUE from emergence to any time. Sole pea had the lowest CRUE in both seasons. The sole maize in 2000 had highest CRUE. However, in 2001 intercrops had similar CRUE to sole maize, suggesting an increase in RUE of peas in intercrops. Nancis had consistently higher CRUE in both seasons compared to Sophy. The results emphasize that radiation capture and use efficiency in sole and intercrops are greatly affected by morphological characteristics of the component crops. In choosing cropping partners for intercropping special attention should be given to selecting cereal crops with erect leaves as against those with droopy leaves. The under-storey legume crop should also have erect or semi erect leaves so as to capture radiation filtering through the cereal canopy in order to maximize the capture and use of photosynthetically active radiation for increased and stable yields.