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ROOT DEVELOPMENT OF MAIZE AS AFFECTED BY WEEDS IN TROPICAL MAJOR AN MINOR SEASONS

C Egodawatta[2], D. Wijesinghe[1], U. Dissanayake[1], U.R. Sangakkara[1],P. Stamp [2]

[1] Faculty of Agriculture, University of Peradeniya, Peradeniya 20400 Sri Lanka
[2] Institute of Plant Sciences, ETH Zurich, 8092 Zurich, Switzerland.
Contact: U.R. Sangakkara ravisangakkara@sltnet.lk (0094 812 389171.2395114)

ABSTRACT

Field studies determined the impact of two aggressive tropical dicot weeds *Mimosa pudica* – Fabaceae and *Acalypha indica* Euphorbeaceae) on root development of maize seedlings over the first 30 days after planting and on seed yields, in major and minor seasons of the tropics. Weeds were sown with maize seeds at a density of 8 plants per sq. Meter. Root length densities were determined and subsamples of roots were used to determine the proportions of monocot (maize) and dicot (weed) roots by examining the vascular bundles. Seed yields were determined at crop maturity. In the major wet season, there were more maize roots in the soil profile, and seed yields were greater than in the minor dry season. In the minor season, there was greater total RLD and the roots of weeds were in a greater proportion in all depths. The roots of acalypha, the upright weed was more prominent at all depths than that of mimosa, a prostrate weed and seed yields of maize were affected to a greater extent by acalypha. The importance of weed management during early growth to reduce competition and obtain greater seed yields was observed.
KEYWORDS: Maize, Weeds, Root growth, Tropical seasons

1. INTRODUCTION

Weeds are considered the most detrimental biotic factor affecting yields of tropical maize, which is the most important highland cereal in the world. Thus weed management is a vital factor, and earlier studies (e.g. Usman et al, 2001; Sangakkara and Stamp, 2006) identify grasses as the most detrimental weeds. Farmers tend to destroy grass weeds and hence the impact of two abundant broadleaved weeds on root growth of maize during early growth and subsequent seed yields were determined under field conditions in major and minor seasons.

2. METHODOLOGY

The field studies carried at the University of Peradeniya, Sri Lanka in 2004/5 major and 2005 minor seasons using plots of 5 x 3 m, which were clean weeded and planted with maize (variety Bhadra OPV). At the same time, seeds of the two weeds (*Acalypha indica* – upright growth habit) and *Mimosa pudica* – prostrate habit) were sown at a density of 8 seeds per sq.m, with a control plot that was completely weed free. The maize was managed as per local recommendations. At 30 days after planting soil cores were dug (@6 per plot) to depths of 0-30 and 30 – 60 cm, roots washed, lengths determined and a subsample used for identifying monocot and dicot roots through microscopy and the respective dry weights determined to separate weed and maize roots. Seed yields were determined in the respective plots at crop maturity and the data was subjected to appropriate statistical analysis to determine treatment differences.

3. RESULTS AND DISCUSSION

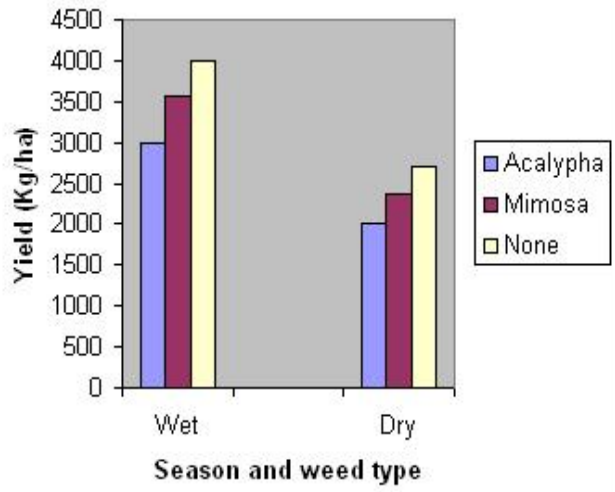
The root distribution in the soil profile was greater in the minor season (Table 1) as shown by RLD due to the low soil moisture content. However in both seasons the presence of acalypha, the

deep rooted weed induced the development of a greater RLD in the soil profile. This was more prominent in the minor dry season. However the presence of roots seems to induce more root development of maize, which could be due to competition for resources. Maize roots were distributed in both layers in the presence of acalypha, and the percentage was greater in the wet season, showing a greater competitive ability, the opposite was seen in the minor season. In the presence of mimosa, the maize roots were more in the top soil layer which could be attributed to the greater presence of mimosa roots in this layer. This suggests that the presence of a greater proportion of weed roots stimulated the development of crop roots as well.

Table 1 Root length densities and percentage roots of maize and weeds in soil profile in major and minor seasons

Weed type	Depth (cm)	RLD ($cm.cm^{-3}$)		% Maize roots		% Weed roots	
		S1	S2	S1	S2	S1	S2
Acalypha	0 - 30	4.85	5.62	79	48	21	52
	30 – 60	3.94	4.68	56	40	44	60
Mimosa	0 – 30	5.46	5.94	74	41	26	59
	30 – 60	3.14	3.99	61	44	39	56
Control	0 – 30	3.18	4.38	100	100		
	30 – 60	2.89	3.55	100	100		
Probability	Weeds	*	*	*	*	*	*
(P= 0.05)	Depth	*	**	*	*	*	*
	Season	*	*	*	NS	NS	NS
	Interaction s	*	*	NS	NS	*	NS

RLD ($cm.cm^{-3}$) = Total length in a soil core/ Volume of core; S1 and S2 are Major and Minor seasons respectively.



Seed yields were greater in the major season due to the more conducive environment for crop growth (Figure 1). However the presence of the deep rooted acalypha weed reduced yields to a greater extent than the prostrate weed, mimosa. The impact of the weeds on seed yields of maize was greater in the minor season. Correlations between the percentages weed roots at 30 days and seed yields were negative and significant, especially in the major season. The study thus clearly demonstrated the impact of different broadleaved weeds on root development of maize in major and minor seasons and the effect of these on seed yields. Thus while grasses have the greatest impact on seed yields of maize (Sangakkara and Stamp, 2006) and thus are controlled, if selective weeding is practiced, the study illustrates the importance of removing the taller broadleaved species as it adversely affects root growth and thus seed yields

REFERENCES

Sangakkara, U.R. and Stamp, P. 2006. Impact of selective weeding on maize productivity in major and minor seasons – a comparative analysis from the Asian humid tropics. Journal of Plant Diseases and Protection Special issue 20:701 – 708

Usman, A., Elemo, K.A. , Bala, A., Umar, A.2001. Effect of weed interference and nitrogen on yields of a maize/rice intercrop. International Journal of Pest Management **47**, 241 – 246.