Determination of Critical Weed Free Period for Peanut Cultivation in Hambantota Area in Sri Lanka

DPP Liyanage, LG Malanie, WAC Ruwan and DLD Lakmali
Grain Legumes and Oil Crops Research and Development Centre, Angunakolapelessa, Sri Lanka

Abstract
Field studies were conducted at research field of grain legumes and oil crops research and development centre at Angunakolapelessa in 2011/12 Maha, 2012 Yala and 2012/13 Maha seasons to evaluate the effects of mixed weed species on peanut yield. The naturally occurring weeds co-exists in the crop plant field were allowed to interfere for various intervals to determine the critical weed-free period. Weeds were broadly categorized into 3 categories grasses, broadleaves and sedges. Two sets of treatments were maintained in the experiments, first set of treatment consisted of weed free periods (WFP) of 2 (T1), 4 (T2), 6(T3), 8 (T4), 10 (T5) weeks from planting, total weed free (T6) and full season weedy (T7). The plots were maintained weed-free until the beginning of the period as treatments, and then weeds were allowed to germinate and compete until the end of the cropping period. The second set of treatments consisted of weedy periods (WP) of 2(T8), 4 (T9), 6 (T10), 8 (T11), and 10(T12) weeks from planting were compared with total weedy and total weed free treatments. The effects of weed existence in various intervals and weed free periods on peanut yield were investigated. Weed free condition was maintained by hand-weeding. The crop was maintained according to the recommendations of Department of Agriculture. The predicted critical period of weed control, in the presence of a mixed population of weeds, was found to be from 3 to 8 weeks after planting (WAP). Peanut yield decreased as weed interference intervals increased, demonstrating the need for weed control throughout the growing season in the presence of mixed weed populations.

Keywords: Critical weed free period, Natural weed population, Weed competition, Weed interference

Introduction
Weed interference resulted in maximum yield losses between 74 and 92% (Agostinho *et al.*, 2006). Weed control is one of the most limiting factors facing peanut producers because weeds interfere with peanut for light, moisture, and nutrients and peanut is a low-growing crop and shades the row middles slowly (Wilcut *et al.*, 1994). Presence of weeds causes a negative effect on the peanut yield (Everman *et al.*, 2008). Therefore, as a common practice to avoid losses due to weeds, they must be controlled throughout the season to avoid yield losses (Jordan, 2006). There are times early and late in the crop growth period in which weeds do not interfere with crop yields, it is reasonable to expect that there is an interval in the life of the crop when it must be kept weed free to prevent yield loss. This period, often called the "critical weed-free period (CWFP)", has been established for many crops (Mohler, 2001). Consequently, CWFP is the time interval, where weed control is essential to avoid a yield loss. Objectives of this experiment were to determine the CWFP, and subsequently the CPWC, for annual weeds in peanut in southern dry zone in Sri Lanka.

Materials and Methods
Field studies were established at research field of grain legumes and oil crops research and development centre at Angunakolapelessa in 2011/12 Maha, 2012 Yala and, 2012/13 Maha seasons. Recommended Tissa variety was planted 45cm a parted rows, the row spacing was 15cm. The plot size was 3mx4m. The experimental design was a randomized complete block with three replicates. There were two sets of treatments maintained in the experiments, first set of treatments consisted of weed free periods of 2 (T1), 4 (T2), 6 (T3), 8 (T4),10(T5) weeks from planting , total weed free (T6) and full season weedy (T7). The plots were maintained weed-free until the beginning of the period as treatments, and then weeds were allowed to germinate and compete until the end of the cropping period. The second set of treatments consisted of weedy periods of 2(T8), 4 (T9), 6 (T10), 8 (T11), and 10(T12) weeks from planting were compared with T7 (full season weedy). The natural weed populations were allowed to compete with the crop from planting to the beginning of weed removal time as treatments, then the plots were kept weed free for the remainder of the season. Weed removal was taken place at one week intervals in maintained weed free periods. Hand weeding was practiced to remove weeds in the experiments.

Results and Discussion
According to the peanut yield data in 1st group of treatments, from T1 to T5 the yields were

gradually increased and T5 which kept 9 weeks weed free from planting showed the best yield in the group in both 2012 Yala and 2012/13 Maha seasons, T7 (No weed control treatment) showed the least yield. T5 and T6 showed significantly higher pod yield in all three seasons. T3 and T4 showed better yield than T1 and T2 in 2011/12maha and 2012 /13 Maha seasons. According to the data of 1st group of treatments, in which weed free situation was 3 to 9 weeks from planting positively affected yield. In the statistical analysis the yield of 1 week weed free situation (T1) and total weedy situation (T7) were in the same group (Table 06). Gradual yield increase could observe when increase the length of the weed free time period up to 9 weeks from planting.

According to the pod yield data of 2nd group of treatments T8, weed free from 2nd week showed the highest yield. Gradually decreased the yield along with treatments from T8, T7 the total weedy treatment gave the lowest yield in the group. The gradual pod yield reduction could observe with the length of the weed interference period from planting. There wasn't considerable difference between obtained yields of 10 weeks weedy treatment (T12) and total weedy treatment (T7), showed that weed removal after 10 weeks from planting has no influence on the yield. A gradual yield reduction was observed with increasing time of weed interference in all three seasons (Table 1).

Conclusions

Peanut yield decreased with the increase of weed interference interval, demonstrating the need for weed control throughout much of the growing season in the presence of mixed weed populations. The critical weed free period is lying between 3 and 9 weeks from planting. The weed management in peanut should be initiated by 3 WAP, and maintained through 9 WAP to avoid appreciable yield losses.

Acknowledgements

Authors wish to express their gratitude to the Sri Lanka Council for Agriculture Research Policy for providing funds to carry out this research, Dr (Mrs.) ASK Abeysekara and Ms K Jayewardene for providing technical guidance and Dr (Mrs.) AP Bentota, Former Additional Director, Grain Legume and Oil crops Research and Development Centre, Angunakolapelessa for given encouragement.

References

Agostinho FH, Gravena R, Alves PLCA, Salgado TP, and Mattos ED 2006. The effect of cultivar on critical periods of weed control in peanuts. Peanut Sci. 33:29–35.

Burke IC, Schroeder M, Thomas WE, and Wilcut JW 2007. Palmer amaranth interference and seed production in peanut. Weed Technol. 21:367–371.

Everman WJ, Burke IC, Clewis SB, Thomas WE, and Wilcut JW 2008. Critical period of grass versus broadleaf weed interference in peanut. Weed Technol. 22:63–67.

Jordan DL 2006. Weed management in peanut. 35–60.

Mohler CL 2001. Enhansing the competitive ability of crops .in ML Liebman, CL Mohler and CP Staver , eds. Echological Management of Agricultural weeds, New York. Cambridge University Press. Pp 269-321.

Wilcut JW, York AC, and Wehtje GR 1994. The control and interaction of weeds in peanut (Arachishypogaea). Rev. Weed Sci. 6:177–205.

Table 1: Pod yield of 10 ground nut plants collected from 1st group of treatments in 2011/12 Maha, 2012 Yala and 2012/13 Maha seasons

Weed free interval from planting (week)	Pod yield/10 plants(g)			Weedy period from planting	Pod yield/10 plants(g)		
	2011/12 Maha	2012 Yala	2012/13 Maha		2011/12 Maha	2012 Yala	2012/13 Maha
1	122.4^{de}	140.5 ^{d}	144.1 ^{b}	Total weedy	92.2 ^{c}	115.2 ^{c}	107.9 ^{d}
3	154.3^{cd}	189.1 ^{cd}	153.9 ^{b}	2	186.8 ^{a}	372.0 ^{a}	296.6 ^{a}
5	186.8^{bc}	257.1 ^{cd}	162.8 ^{b}	4	180.9 ^{a}	263.7 ^{ab}	225.1 ^{ab}
7	180.8^{bc}	291.9 ^{bc}	244.9 ^{a}	6	149.6 ^{ab}	314.8 ^{ab}	217.9 ^{b}
9	210.3^{ab}	467.3 ^{a}	252.1 ^{a}	8	150.9 ^{ab}	212.6 ^{bc}	209.4 ^{bc}
Total weed free	230.5 ^{a}	348.5 ^{ab}	175.7 ^{b}	10	126.9 ^{bc}	241.8 ^{abc}	141.3 ^{d}
Total weedy	92.2 ^{e}	115.2 ^{d}	107.9 ^{c}	CV%	19.0	30.16	19.94
CV%	13.2	31.21	14.53	LSD (0.05)	51.12	138.95	72.43
LSD (0.05)	39.51	143.56	45.84				

Within each column, the means followed by the same latter are not significantly different at p >0.05