Impact of Level of Nitrogen Fertilization and Critical Period for Weed Control in Peanut (*Arachis hypogaea* L.).

جهة و تاريخ النشر :

Agronomy. 11(5): 1-18. https:// doi.org/10.3390/agronomy11050909.

Accepted: 1 May 2021

Abstract

To avoid competing with economical plants, weed control must be implemented with a clean and appropriate strategy. Since the efficiency of leguminous crops in biological fixation of the atmospheric N_2 is severely affected when grown under stressful conditions (the soil tested in this study was salt-affected; ECe = 8.99 dSm^{-1}), an appropriate level of N fertilization should also be applied. Two field trials were performed in the 2018 and 2019 seasons to investigate the influences of soil-applied nitrogen (N) levels [48 (N_1), 96 (N_2), and 144 kg N ha^{-1} (N_3)] and critical timing of weed removal (CTWR) on weed control efficiency, improving weed control, yield traits, and quality attributes in peanut (*Arachis hypogaea* L.). Each trial was conducted with three replicates and planned according to a split-plot in a completely randomized design. The results revealed that N levels had significant ($p \leq 0.01$) variations for the dry weight of all weeds tested (narrow-leaved, broad-leaved, and total annual weeds), pods and seed weight and yields, N use efficiency, and oil and protein yields (t ha^{-1}) in peanut in both seasons. N_3 outperformed both N_1 and N_2 with respect to the above-mentioned traits, however, it decreased N use efficiency and seed oil content compared to N_1 and N_2, respectively. Dry weight of weeds and seed harvest index were significantly ($p \leq 0.01$) increased, while seed oil and protein contents, N use efficiency, and yields of pods, seeds, and protein were decreased, with increased weed interference (with peanut plants) period in both seasons. In both seasons, the interaction effect of N x W (weed removal time) was significant ($p \leq 0.01$) on the dry weight of weeds and peanut traits, including seed oil content, N use efficiency, and yields of pods, seeds, and protein, and their highest values were obtained with N_3 x W_6 (weed-free for the whole season). The CTWR had growing degree days (GDDs) of 221.4 and 189. These two GDDs each corresponded to 2 weeks after emergence

(WAE) in both growing seasons. The critical weed-free period (CWFP) had GDDs of 1400 and 1380. These two GDDs corresponded to 9.5 and 10 WAE, respectively. The combination of CTWR and CWFP resulted in a critical period of weed control (CPWC) of 2–9.5 and 2–10 WAE in both growing seasons, respectively, for the peanut crop with an acceptable yield loss of 5%. A high positive ($p \leq 0.01$) correlation was noted between oil yield and seed yield ($r = 0.999^{**}$ and 0.999^{**}). However, a high negative ($p \leq 0.01$) correlation ($r = -0.723^{**}$ and $= -0.711^{**}$) was found between dry total annual weeds and seed weight in the first and second seasons, respectively. The stepwise regression analysis revealed high significant participation of two traits (i.e., seed yield and oil content) and three traits (i.e., seed yield, oil content, and weight of seeds) in the variations in oil yield in the first and second seasons, respectively. These results recommend the use of N fertilization at a rate of 144 kg N ha^{-1} in conjunction with keeping the soil free of weeds throughout the season to maximize peanut productivity under saline (8.99 dSm^{-1}) conditions.