

ABSTRACT

DEVELOPMENT OF AN AUTOMATED COTTON THINNING MACHINERY

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Thinning is the labor intensive and high cost process of cotton plant cultivation. The cotton is one of the most important products of agriculture and agro-based industry in our country. In this study, the applicability of an automated cotton thinning machinery which will save human labor and reduce process costs based on plant sensing has been carried out. According to this purpose the design and prototype of an automated cotton thinning machinery based on optical sensing and pneumatic control have been conducted. Field performance of the machine was determined. The design and strength analysis of the proposed machine was performed using Computer-Aided Design techniques then the prototype of the proposed machine was manufactured. All systems were integrated after the functionality tests of the sensing system carried out under laboratory conditions.

In the field experiments, work efficiencies, uniformity of distribution and thinning efficiency have been determined for three different forward velocities (0.23, 0.58, 0.84 m/s) and three different planting distances (5.8, 7.1, 9.8 cm). Field experiments were carried out on parcels using randomized block design. The results from field experiments showed that the highest work efficiency for the automated cotton thinner was determined at 0.84 m/s forward velocity and 9.8 cm inter-row sowing distance. The highest success of thinning was obtained at 0.23 m/s forward velocity and 9.8 cm of inter-row sowing distance. It was observed from the results optimal working conditions of the machine are at 0.58 m/s forward velocity and 7.1 cm inter row sowing distance for the reliable plant density value of 70000 plants/ha in an acceptable range.

Key words: Cotton, thinning, thinning machinery, automatic control.