ABSTRACT

DESIGN AND DEVELOPMENT OF THERMAL BASED DEFOLIATION MACHINE FOR COTTON PRODUCTION

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In this study, it is aimed to design and develop a thermal based defoliator which can be used an alternative application to chemical defoliants that are applied in pre-harvest period, in cotton cultivation.

Computer aided design programs were used to design and develop thermal based defoliation machine. Strength, air and thermal flow analysis was done using SolidWorks® 2010 Premium program which employs Finite Element Methods for analysis. This study was done in the same location for two consecutive years with three cotton varieties. Thermal treatment, chemical treatment and non-treatment groups were compared in terms of leaf kill, defoliation, fiber quality, yield and treatment costs. While leaf kill was 100% in first 24 hours for thermal treatment, it is up to 56% for chemical treatment and 13% for non-treatment, after 19 days. At 19 days after the treatments, defoliation rate reached 90% in thermal treatment plots, 50% in chemical treatment plots and 10% in non-treatment plots, approximately. There were no statistical differences between treatments, in terms of fiber quality and yield. When treatment costs were compared, thermal treatment could be an alternative to chemical treatments. Furthermore, thermal treatment makes harvest by machine possible in organic cotton cultivation and also can take harvest-time earlier.

Key words: Thermal defoliator, cotton, cotton harvest, defoliation, finite element methods.