عنوان مقاله:

Modeling and Design of a Disk-Type Furrow Opener's Coulter Its Mechanical Analysis and Study for No-Till (Machinery (Combination and Bertini

محل انتشار:

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خلاصه مقاله:

No-till practices play an important role in decreasing production costs, increasing soil organic matter content, improving soil structure and removing unwanted environmental impacts. However, due to a lack of access to proper machinery for direct seeding in unplowed lands, such practices have failed to produce successful results since they are incapable of providing sufficient contact between soil and seeds. Introducing a machine that can plant seeds and fertilizer at two different depths in hard (unplowed) soils covered with last season's crop residues can be the first step towards pilot no-till initiatives. This step can finally lead to the promotion of this practice in the potential areas. The total actual forces imposed to a furrow opener in practice is multiple times larger than a design's total. There are a number of factors contributing to this phenomenon including unknown environmental factors in soil, existence of fine and coarse gravels, and also different partial, unpredictable loads produced on impact with the soil. Empirically and practically, as well as based on results from agricultural projects on no-till machinery in Iranian arid and semi-arid regions, disk (rotary) coulters of a furrow opener set sustain heavy damages during no-till farming. Therefore, the 4mm thickness of coulters on no-till machinery was increased to 6mm. On the other hand, several parameters can influence the soil, as a result, the safety factor was also increased to improve the furrow opener's resistance against rocks, unknown soil factors, etc. In this study, different components of a disk furrow opener were optimally designed in Solid Works modelling software. ANSYS was used to analyze this furrow opener and its three main related components. Finally, the coulter's stress was determined using the von Mises criterion. The result showed that the minimum coulter stress was 1985.5Pa throughout the plane and its maximum belonged to the holes inside the hub with 1.0819x107Pa. The safety factor of the initial coulter was 17.85, while that of the optimally designed coulter was 25.

کلمات کلیدی:

No-till farming; Direct planting; Rotary coulter; Solid Works; ANSYS