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Design and Experiment of Orchard Gas Explosion Subsoiling and Fertilizer Injection Machine

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Abstract : At present, the orchard ditching and fertilizing technology has a series of problems, such as easy tree roots damage, high energy consumption and uneven fertilizing. In this paper, a gas explosion subsoiling and fertilizer injection machine was designed, which used high pressure gas to shock soil body and then injected fertilizer. The drill pipe mechanism with pneumatic chipping hammer excitation and hydraulic assistance was designed to drill the soil. The operation of gas and liquid fertilizer supply was controlled by PLC system. The 3D model of the whole machine was established by using SolidWorks software. The machine prototype was produced, and field experiments were carried out. The results showed that soil fractures were created and diffused by gas explosion, and the subsoiling effect radius reached 40 cm under the condition of 0.8 MPa gas pressure and 30 cm drilling depth. What’s more, the work efficiency is 0.048 hm²/h at least. This machine could meet the agronomic requirements of orchard, garden and city greening fertilization, and the tree roots were not easily damaged and the fertilizer evenly distributed, which was conducive to nutrient absorption of root growth.

Keywords : gas explosion subsoiling, fertigation, pneumatic chipping hammer exciting, soil compaction
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