RESEARCHES REGARDING THE DESIGN AND ACHIEVEMENT OF A FERTILIZATION MACHINE IN AGGREGATE WITH A MOTOCULTURE FOR GREENHOUSES AND SOLARIUMS

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Abstract

The experiments were focused on the design and execution of the equipment for the administration of solid chemical fertilizers within the disciplines of Mechanization of the Ion Ionescu de la Brad University of Agricultural Sciences and Veterinary Medicine in Iasi. The determination of uniformity administration of solid chemical fertilizers was achieved using the gravitational method. Experience have shown that the equipment satisfies the qualitative requirements and qualities of fertilizer uniformity using a high precision method for determining the distribution of the fertilizer.

Key words: *fertilization, motocultor, uniformity.*

Soil, as an accumulation by decomposing an aged parent material, provides the foundation for plant growth and most nutrients. Elements released become available to plants as nutrients, following a process that takes a long time, the soil being the only result of the parent material. Therefore, what is at the disposal of a plant at some point can not ensure the need for a growing plant, which is why fertilization complements the existing soil with the necessary additional nutrients. Thus, fertilization wisely and rationally increases yield, quality and profits.

In greenhouses and solariums, the consumption of mineral substances by crop plants is very high, obtaining high yields depending not only on basic fattening, but additional fertilization is necessary (Stan, 2010).

For the fertilization of soil for vegetable crops in protected areas, machines and equipment are used which distribute different types of fertilizers, respecting the fertilizer requirement imposed by plant requirements, pursuing the achievement of distribution uniformity with a maximum permissible deviation of + 20% (Scripnic, 1979).

The administration of solid chemical fertilizers and amendments is done mechanically, by spreading or incorporating, using machines, devices and special or universal equipment, showing constructively-functional characteristics according to the culture to which they are addressed and the manner of applying the fertilizers.

Machines for the administration of solid chemical fertilizers are used to spread them on the soil surface uniformly and in well-determined quantities on the surface unit (Suditu, 2003).

MATERIAL AND METHOD

The experiments, which are the object of this article, focused on the design and execution of equipment for the management of solid chemical fertilizers within the disciplines of Mechanization of the Ion Ionescu de la Brad University of Agricultural Sciences and Veterinary Medicine in Iasi.

The solid chemical fertilizer equipment was mounted on a VALPADANA Blitz 120 Rev (*figure 1*). The equipment serves to spread solid chemical fertilizers on the soil surface.

The equipment has 3 sections with a total working width of 110 cm, the spreading width being 4-5 m. The machine is operated by the tiller using the cardan shaft. Constructively, the equipment consists of subassemblies: fertilizer distribution sections; support wheels; transmission mechanism (*figure 1 a, b*). Each of the three sections consists of a box, stirrer, distributor, driving tube (*figure 1*).

The fertilizer box (*figure 2 a*) is attached to the frame, made of sheet metal, has the parallelepiped shape at the top and the pyramid trunk at the bottom. It has a feeder covered with a lid. Inside, at the bottom, there is a stirrer (*figure 2 b*) and a distributor (*figure 2c*) in a distribution box.

The rotative stirrer is in the form of a fist shaft, horizontally placed at the bottom of the fertilizer box, and its role is to prevent the formation

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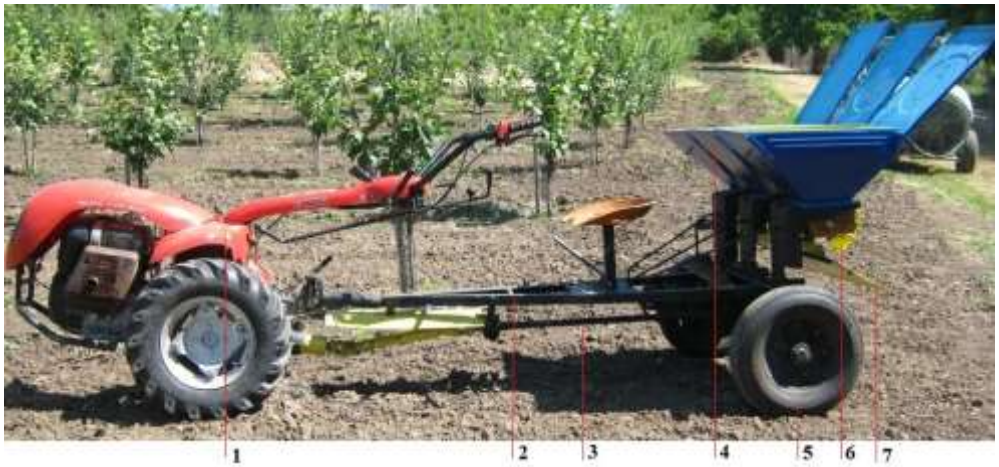
of vaults in the fertilizer mass in order to continuously leak it to the distributor.

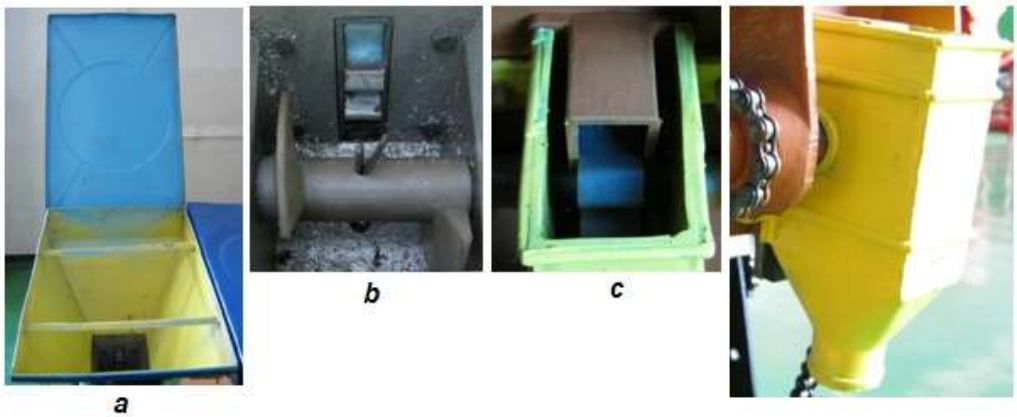
The transmission mechanism includes a gear drive, a chain transmission, intermediate transmissions, transmission to the drive shaft and a conical gear reducer (*figure 3*).



a

b

Fig. 1 **Solid chemical fertilizer equipment**:
a – *lateral view*; ***b*** – *back view;* 1 – motocultor; 2 – chassis;
3 – transmission mechanism; 4 – fertilizer box; 5 – support wheel; 6 – distribution box; 7 – spreading plate.



a ***b*** ***c*** ***d***

Fig. 2. **Work section** (*details*):
a – fertilizer box; ***b*** – rotative stirrer; ***c*** – distributor; ***d*** – driving tube.

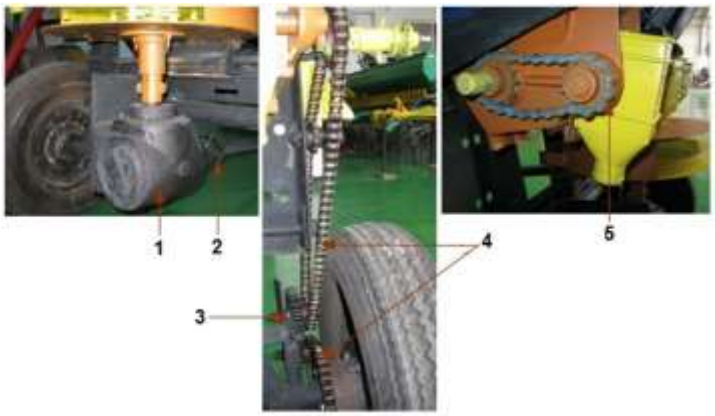


Fig. 3 **Transmission mechanism**:
1 – conical gearbox; 2 – shaft transmission; 3 – gear drive; 4 – chain transmission; 5 – intermediate transmission.

The research on the level of uniformity of the applied fertilizer using the gravitational method, was carried out using the spreading plate attached to the fertilizer application equipment (*figure 4*).

In order to perform the experiments, the ground was prepared using a milling cutter, followed by compaction with an annular roller and a smooth roller, to homogenize and compact the soil (*figure 5*). The determination of the administration uniformity of solid chemical fertilizers using gravitational method was achieved using three toothed gear ratios. The experience was influenced by the transmission ratio with three variants.

Fig. 4 **Granular solid fertilizer delivery equipment**:

a ***b*** ***c***

Fig.5 **Ground preparation** *(original photo):*
a – soil shredding; **b**, **c** – compaction of soil.

For each transmission ratio, was recorded a distance of 102 m and 3 m of start which meant the tolerance interval, the interval at which administration became constant. Prior to the initiation of the tests, an equal amount of fertilizer was equally metered into each distribution box.

The distance traveled for testing was systemized into 5 sections of 20 m, each section being marked by a picket and meaning a repetition. After the fertilizer administration (*figure 6*), the determination of the administration uniformity was achieved with a 30 cm side metric frame (*figure 7*). The frame was randomly placed on the surface of each section, taking five photographs from different positions of the section. The photographs taken served to the final analysis of the spreading uniformity, being processed in special programs.

Fig.6 **Gravitational use of fertilizers**

Fig. 7 **Metric frame**

CONCLUSIONS

Experience has shown that the equipment satisfies the qualitative requirements and qualities of fertilizer uniformity using a high precision method in order to determine the distribution of the fertilizer.

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