

## SEED DRILL WITH COULTERS IN THE TECHNOLOGY OF SEPARATE SOWING AND FERTILIZER INTRODUCTION

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In the northern regions of Kazakhstan sowing of the agricultural crops mainly is carried out by the drills and fertilizer cultivators from abroad. Depending on the culture and the soil drills are completed with different openers and sets of working bodies: one-disk, cultivator point with two-line or one-line openers, etc. They provide different ways to make the seeds and the fertilizers: fertilizing together with the sowing of seeds; fertilizer and seeds separately in different soil horizons; mineral fertilizers away from the row [1].

From the review of the design and technological schemes of core grain fertilizer drills it follows that in most parts of the designs of the planters SZTS-6 SZTS-12-ESS 2.1, John Deere, Amazonia, Massey, Fergysussen, Astra 3,6, Astra Nova 5 4A -06; SZ-3,6A and others seed and fertilizer is carried out simultaneously in one row (one depth of the horizon). Most foreign planters are equipped with double disc coulters and one line press wheels, i.e. single node design [2]. The main drawback of this method is the insufficient effectiveness of fertilizers, especially at low soil moisture seed layer.

In other configurations, seeders, such as John Deer 1895, TUME Nova Combi, HORSCH Sprinter ST etc. the application of fertilizers and seeds is produced separately in different soil horizons. To make use of this method double opener Horsch "Duet" is used which provides broadband seeding at 18-20 cm depth of seeding up to 7 cm. The opener "Duet" is capable in one operation to sow, fertilize and at the same time cultivate the soil and effectively remove crop residues from horizon crop [3]. A distinctive feature of this opener is that it allows you to apply a system of simultaneous application of fertilizers in the soil just below the strip planting at a depth of 4-5 cm below the horizon. This eliminates the possibility of chemical burns of the seeds. However, the disadvantages of this type of opener is that it does not produce a continuous tillage and cropping of weeds, and also combines the operations of soil cultivation and seeding. As a result, an increasing number of manufacturing operations, and as a consequence, increase energy consumption for tillage.

Construction and fertilizers have a universal pneumatic seeders UPS and UPS -8 -6 Nova Combi firms, allowing to make fertilizers away from the row with the seeds with the required offset value [4]. For carrying out of this method additional openers are set which impair their patency at work on stubble, and increase the cost of the drill. The main operating element is a fertilizer distributing coulters unit. The planters also direct sowing Amazone DMC Primera such work items are chisel coulters with a distinct ability to penetrate into the soil. [5]. The disadvantages of these working elements is the complexity of their design, and power consumption of the process. In addition, the bulk of the seeds introduced with deviations from the desired depth, which often reach 0.03 m or more [6].

The main disadvantage of all the above drills is that fertilizers are used only in the case where the seed layer of soil humidity favors the formation of secondary root system, i.e. where the root system of plants is higher fertilizer layer. In other cases, when there is insufficient moisture seed layer, the root system of plants is below the layer sown and fertilizers are not used as a starter, in the initial period of plant development. In addition, there is evidence showing undesirable contact of mineral fertilizer with the seed, affecting seed germination.

In addition, for the separate application of fertilizers and sowing seeds different types of openers are used, including combined. Depending on the design of coulters, fertilizer may be sealed together or separately with seeds. The review of existing

designs openers used in the agricultural industry has allowed to establish a number of shortcomings, which greatly affect the quality of the crop, which in turn leads to lower yields.

Summing up the above analysis, we note the existing drills and working bodies to separate seed and fertilizer do not fully ensure the implementation of agro-technical requirements for the zone of Northern Kazakhstan. Therefore, the creation of stubble sowing and fertilizers with a separate seed and fertilizer is a major challenge. The novelty of the proposed seeder is that the implementation of the separate seed and fertilizer at planting is done at the expense of modernization and seed boxes are sealed parts. The formulation and fertilizers stubble seeder with a separate seed and fertilizer put the scheme tested in different soil-climatic zones of the CIS-planters cultivators type ESS, namely SZTS 2.0 while performing presowing loosening the soil, seeding, and fertilizers introduction and after sowing compacting.

A constructive and technological scheme of the proposed stubble seeders and fertilizers with a separate seed and fertilizer was developed. Features and fertilizers stubble seeder with a separate seed and fertilizer are: tray, which directs seeds and fertilizers separate thread; as opener stacked seed and fertilizer in different soil horizons and extended the lead packer section.

To improve the efficiency of fertilizers and crop yields, we developed an experimental cultivator tip opener to separate seed and fertilizer [7], which consists of a tubular bar, cultivator tip, two side plates, brackets, seed director and couplings. From the structural and process analysis technology separate seed and fertilizer the following design parameters of drill coulters are identified: diameter of seed director 25 mm, work of the seed director vertically 50 mm and the work of the seed director horizontally 50 mm, the distance from the lowest point of the seed director to the bottom of plate 105 mm, Figure 1.

It is known that at a minimum, and the traditional technologies of cultivation of agricultural crops sowing coulters make existing seed and fertilizer in one horizon. In this case the fertilizer used efficiently, since they are located above the plant root system and are not used as starting that adversely affect plant growth and productivity. In addition, the openers are used, which make fertilizer below the level of seeding, however, these workers are also very expensive and not adapted to the soil conditions of Northern Kazakhstan.

To solve these problems we have proposed Tine experimental opener for separate seed and fertilizer, with a diameter of seed director 25 mm, travel of seed director vertically 60 mm, seed director travel horizontally 70 mm, the distance from the bottom of feet to the bottom of plate 30 mm, Figure 2.

Separately, the technological schemes of the trays are justified, then trays were designed for crop seeds and fertilizers. The tray consists of two parts: the seed and fertilizer, each part ends with sleeves. The slope of the inside of the wall exceeds the value of the friction angle of the seed and fertilizer on the tray material. The design parameters of the tray with seed and fertilizer distributing machines: 300x210x48 mm and the diameter of the sleeve for joining semyatukoprovodov 26 mm. The distance between the points of connection to fertilizer box is 180 mm. Nine trays were prepared to separate seed and fertilizer for the pilot drill.

Based on the research and development, scientific and design organizations and firms of CIS and foreign countries, and as well as on the results of search experiments conducted in S.Seifullin KazATU experimental setup of stubble seeders and fertilizers with a separate seed and fertilizer was proposed.

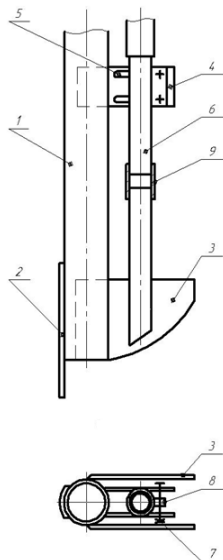


Figure 1- drill furrow-opener point for separate seed and fertilizer introduction

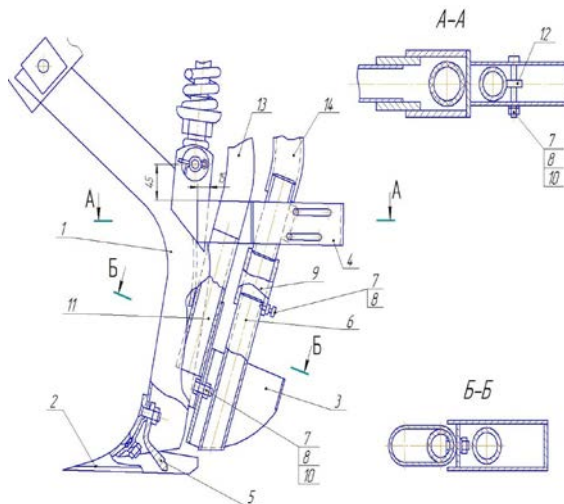


Figure 2 – Sweep cultivator for separate seed and fertilizer introduction

To obtain reliable results and conclusions on the justification of parameters of working organs of tine opener and preparing the recommendations to the production further research is necessary.

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