THE SOWING OF VEGETABLE GEMINATED GRAIN USING A HYDROSEEDER

Urgency of the research. The article deals with the problem of early harvest of vegetable crops without the additional use of herbicides and other chemicals, since all this reduces the nutritional value and the usefulness of early vegetables. Transportation of vegetables from the southern areas requires additional costs affecting the price of early products.

Target setting. In order to improve the quality of vegetables, as well as to reduce the time of appearance of even and level sprouts, the method of sowing vegetable geminated grain with the help of a hydroseeder was offered.

Actual scientific researches and issues analysis. The scientific researches of Cherkashchenko H. M., Deshko V. I., Konoval A. A., Kuzmenko L. I., Yashchuk D. A., Olkhovsky M. F., Bakum M. V., Munchisky Yu. A., Klimchuk A. D., Boyko V. B., Trufliak E. V., Yarkin D. S. are devoted to the design of the sowing machine to sow germinated seeds.

Uninvestigated parts of general matters defining. However, the proposed designs of sowing apparatus are not suitable for sowing germinated of light vegetable sprouted seeds, since the starch in the seed peel upon contact with water leads to the adhesion of seeds to the parts of the sowing apparatus. It is the reason of seeds and sprouts damage during sowing, low field germination, and as a result, inefficiency of using the sowing apparatus.

The research objective. The purpose of the article is to describe the structure of the designed hydroseeder, its technical characteristics and operating principles; present the results of the study how the concentration of germinated vegetable seeds in working tanks influences the seeding evenness.

The statement of basic materials. The author of the article developed the construction of a hydroseeder in which the process of seeds preparation for sowing and the dosed sowing of seeds by aerohydraulic method together with the liquid without sprouts damage take place. The article deals with the construction of a hydroseeder and the principles of its operation. The proposed hydroseeder is especially effective for sowing of moist and germinated grain on the household plots, in the country gardens, in greenhouses when growing vegetable crops and medicinal plants. This hydroseeder is multifunctional. It can be used for direct watering of plant in a row with a small water dose or with a nourient solution. The designed hydroseeder also allows to provide presowing preparation of the seeds namely to aerify (to bubble) seeds.

The results of the research how the concentration of vegetable geminated grain in working tanks influences the seeding evenness were presented.

Conclusions. The use of a hydropower allows you to create normal conditions for germination of seeds and getting early sprouts in a short time, which is an important task in the technology of early vegetables growing. Otherwise, the index of field similarity of the seeds decreases, the required density of plants is not ensured, the output of standard products is reduced.

The preliminary tests of the hydroseeder have shown that its use does not only shorten the time between the seeding process and the emergence, but also economizes seeds. This is very important in modern economic conditions, when vegetable seeds are quite expensive.

Keywords: vegetables; sowing machine; hydroseeder; germinated seeds; research.

Fig.: 5. Table: 3. References: 6.
the study how the concentration of germinated vegetable seeds in working tanks influences the seeding evenness.

The statement of basic materials. The author of the article developed the design of a hydroseeder in which the process of seed preparation takes place. This hydroseeder allows to do dosed sowing of seeds by aerohydraulic method together with a liquid without seeds damage (Fig. 1).

This hydroseeder contains a compressor mounted on a frame with wheels, driven by an accumulator battery; a receiver with an air cock to control air pressure in the working tanks. The bin is filled with water through the inlet placed above the frame. It is possible to add fertilizers, herbicides and germinated seeds. Bubbles of air blend the mixture through the injectors.

Then the mixture by gravity enters the throttle valve through the nozzle, where it is proportioned and distributed into two ducts and flows into the working tanks. In the working tanks the seeds bubble, and, due to the air pressure changing the mixture is divided into portions and passes through the trap along the grain conductor to the coulters that sow the seeds in the furrow.

After that the coverers located behind the coulters, cover the furrow, and the roller consolidates the soil, providing retention of moisture.

The hydroseeder consists of a frame 20 with wheels on the axis 14, there is a bin 1 on the top of the brackets, a safety valve 2. There is an accumulator battery 9 on the frame platform, a compressor 3, a receiver 4, an air cock 17, a rope of the air crane 12, connecting air ducts 19, injectors 8. A throttle valve 18 with nozzles 10 are connected to the bin. The nozzles are mounted into the covers of the working tanks 11 and the cable is controlled by the valve 13. The working tanks are attached to the frame through the holes 16. Grain-conductors 5 are linked with the coulters 6 and attached to the axis with the help of brackets with the coverers 15. The roller 7 is attached to the frame behind the coverers.

The process of seeding of germinated grain by a hydroseeder is as follows: a bin placed on a frame 20 is filled with the water and fertilizers through the inlet. Then the germinated seeds are put into the bin. After the hydroseeder enters the stint, using the lever located on the steering
wheel, one can open the air cock 17 for supplying air into the bin to mix and prevent the seed settling on the bottom of the bin, as well as in the working tanks 11.

The water and seed mixture is brought partially from the bin 1 through the nozzles 10 and throttle valve 18 into the working tanks 11. This mixture is bubbled by the air from the injectors 8. The air enters the working tanks through perforated bottoms and raises the seeds to the traps connected by seed lines 5 with the coulter 6. Changing the air pressure from 0.5 to 2 atm. And regulating the gap of the throttle valve, one can dose the amount of seed mixture coming from the bin. Upon completion of the furrow we stop the supply of the mixture through the throttle valve and reduce the air pressure to the minimum.

There is the technical characteristics of the hydroseeder in Table 1.

![Table 1](https://example.com/table1.png)

### Technical characteristics of the hydroseeder

|                          |                |
|--------------------------|----------------|
| **accumulator battery**  | 12V9Ah         |
| **compressor, l/min**    | 35/40          |
| **tank volume, l**       | 6.3            |
| **receiver tank volume,**| 20.5           |
| **Hydroseeder volume, l**| 1.8            |
| **Grain-conductor diameter, mm** | 16 |
| **Number of coulters, pcs.** | 2   |
| **depth of sowing, cm**  | 2-4            |
| **working width, cm**    | 65             |
| **row width, cm**        | 15-35          |
| **weight, kg**           | 53             |

The proposed hydroseeder is especially effective for sowing of moist and germinated grain on the household plots, in the country gardens, in greenhouses when growing vegetable crops and medicinal plants.

This hydroseeder is multifunctional. It can be used for direct watering of plant in a row with a small water dose or with a nutrient solution. The designed hydroseeder also allows to provide presowing preparation of the seeds namely to aerify (to bubble) seeds.

The research of the sowing process of carrots and radish germinated seed was conducted to check the work of the hydroseeder (Fig. 2).

![Fig. 2. Hydro seeding of the carrots in the experimental field](https://example.com/fig2.png)

Laboratory research was conducted to determine how the concentration of vegetable germinated grain in working tanks influences the seeding evenness.
The calculation was done on the basis of the sowing rates of dry vegetable seeds (Fig. 3). According to the rates the amount of pre-soaked and germinated carrot and radish seeds per one hundredth of a hectare was calculated (Table 2, Fig. 4).

![Fig. 3. Calculation of seeds sowing rates](image)

**Table 2**

| Crop     | Dry seeds, gr./one hundredth of a hectare | Soaked seeds, gr./one hundredth of a hectare | Germinated seeds, gr./one hundredth of a hectare |
|----------|-----------------------------------------|---------------------------------------------|-------------------------------------------------|
| Carrot   | 4 - 6                                    | 3,2 – 5,2                                   | 2,9 – 4,9                                       |
| Radish   | 15 - 20                                  | 11,8 – 16,8                                 | 10,2 – 15,5                                     |

![Fig. 4. Comparative charts of the sowing rates of dry, soaked and germinated seeds](image)

Thus, the calculations have shown that seed soaking and germination do not only shorten the time of emerging crops, but also considerably save expenses for seeds.

In order to study the evenness of seeding, the density of plants was taken into account. According to the standards: for carrots - 900-1500 pcs/one hundredth of a hectare, for radish – 400-1000 pcs/one hundredth of a hectare (Table 3). The conducted research and calculations showed the following results (Fig. 5).
Table 3

Density of plants sown with dry, soaked and germinated vegetable seeds per one hundredth of a hectare

| Crop      | Dry seeds, pcs/one hundredth of a hectare | Soaked seeds, pcs/one hundredth of a hectare | Germinated seeds, pcs/one hundredth of a hectare |
|-----------|------------------------------------------|---------------------------------------------|-----------------------------------------------|
| Carrot    | 800-900                                  | 678-778                                     | 585-685                                       |
| Radish    | 100-200                                  | 74-174                                      | 62-162                                        |

Fig. 5. Comparative charts of plant density sown by dry, soaked and germinated vegetable seeds

Less concentration of soaked and germinated seeds in the working tanks of the hydroseeder increases the seeding evenness and subsequently makes unnecessary thinning of plants.

Thus, seeding with soaked and germinated seeds can reduce the plant density, improve the seeding evenness, which positively influences the future harvest.

Conclusions. The use of the hydroseeder allows to create normal conditions for seeds germination in a short time, which is an important task of the technology of early vegetables growing. Otherwise, the seeds germination index lowers, the required density of plants is not ensured, the output of standard products is reduced.

The preliminary tests of the hydroseeder have shown that its use does not only shorten the time between the seeding process and the emergence, but also economizes seeds. This is very important in modern economic conditions, when vegetable seeds are quite expensive.

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Проведені попередні дослідження гідросівалки показали, що її використання не тільки зменшує термін між процесом висіву та появию сходів, а і сприяє суттєвій економії насіння. Це є дуже важливим в сучасних економічних умовах, коли насіння овочевих культур є досить дорогим.

Ключові слова: овочі; висівний апарат; гідросівалка; пророщене насіння; дослідження.

УДК 631.331

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ВИСЕВ ПРОРОЩЕННИХ СЕМЯН ОВОЩНИХ КУЛЬТУР С ПОМОЩЮ ГИДРОСЕЯЛКИ

Актуальність теми дослідження. В статьї розглядається проблема отримання раннього урожаю овочних культур, без додаткового використання гербицидів і інших хімічних засобів, оскільки це призводить до зменшення питомої вартості та кількості ранньої продукції. Це відставає у процесі вирощування овочів, що має великий економічний ефект.

Постановка проблеми. Спробою виробництва зеленого урожаю, а також зменшення часу появлення рослин, отримання ранньої продукції.

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Виснаження незадовільних частин об'єднаних проблем. Одним з основних завдань є зменшення часу появлення сходів, отримання ранньої продукції.

Постановка завдань. Описати структурно-конструктивні риси гідросівалки, її технічні характеристики та принцип роботи. Представити результати досліджень по визначенню якості висеву пророщених насінних зарядок і визначенню впливу концентрації пророщених насіннь на рівність висева.

Висновки. Гідросівалка дозволяє розрахувати оптимальні умови для висеву насінних зарядок і визначити час висіву, що відповідає вимогам поліпшення урожаю овочів.

Ключові слова: овочі; висівний апарат; гідросівалка; пророщене насіння; дослідження.

Рис.: 5. Табл.: 2. Бібл.: 6.

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