Innovative technology to increase the yield of cotton, wheat and other agricultural crops to ensure the acceleration of their maturation, resistance to diseases and to ensure environmental cleanliness of the crop

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Abstract. The article briefly describes the innovative technology developed and implemented in the fields of many farms in the Tashkent, Kashkadarya regions, in the Ferghana valley and in the North-Eastern region of the Republic of Kazakhstan (Ust-Kamenogorsk) for processing seeds of cotton, wheat and other agricultural crops in high-voltage electric fields. The novelty of this technology, in contrast to the known methods of pre-sowing seed treatment in an electric field, is that the seeds of these crops are subjected in series and in parallel to the effects of high-intensity electric fields of alternating, direct and pulsed currents of different intensity, duration of exposure and sequence of action. In addition, a number of technological solutions have been implemented in the seed processing line to improve the quality of their processing. The results of this technology can significantly increase crop yield (for example, for cotton at least 25%, for wheat at least 40%); improve crop quality; accelerate its maturation for 12-20 days, depending on the type, variety of plants and climatic conditions of the area; reduce the amount of seed material (seeds) by 2-2.5 times; get an environmentally friendly crop and eliminate the use of pesticides, plant diseases and crop.

1. Introduction

The growing human need in food products, with an annual increase of population, decreasing irrigated and suitable for agriculture fields, growing water shortage and rising climate disasters confronts scientists the task of finding and solving the issue of increasing productivity of plants and, primarily, wheat, other grains, cotton, silkworm, vegetables, fruits, vegetable oils and other food products and clothing. At the same time, it is necessary to take into account the still existing water shortage in many regions, the need to ensure the ecological cleanliness of crops, land and people.

In many developed countries, good results have been achieved in terms of crop yields, their external attractiveness, and their capacity for long-term and long-distance transport. However, it should be noted that all this is achieved due to the abundant consumption of fertilizers, pesticides and the use of genetically modified technologies. All this, firstly, worsens the taste of the crop and, secondly, negatively affects the health and heredity of its consumers. To increase crop productivity, a large number of different methods and technologies have been proposed and applied, including the influence of a high-tension electric field on their seeds.
However, these methods can increase crop yields by up to 10-12% [1, 2]. We have also been conducting research on the effects of a high-intensity electric field on cotton seeds for a long time (from the early 70's to the late 80's of the last century) and have obtained representative results of increasing yields by more than 10%. Installations were developed and manufactured for this purpose, which, in addition to working in the laboratory itself, were installed in the technological line of the Chinaz cotton plant. But since 1990, we have started to conduct research on the effects of several types of high-intensity electric fields on cotton, wheat and other crops: direct, alternating and pulsed currents, while changing the magnitude of the intensity, duration and sequence of its effects within a large range.

At the same time, starting from 1990, samples of seeds processed in electric fields were sown by us at the laboratory site together with untreated seeds – control. Studying the results of the influence of high-intensity electric fields by various modes of seed treatment on their germination, plant development, the timing of flowering, fruiting, full maturation, on the quantity, weight and quality of the crop, in subsequent years we selected the best treatment modes for specific plant varieties. As a result of 30-year tests and research in the laboratory and on tens of thousands of hectares of fields in different regions of Uzbekistan and Kazakhstan, we currently have a fairly proven innovative technology to increase the yield of cotton, wheat, melons and industrial crops, to ensure their acceleration of maturation, resistance to diseases and to ensure their environmental cleanliness.

2. Materials and Methods
The study of the effect of high-intensity electric fields on the characteristics of seeds and their plants was performed at 3 levels. Let's show the example of cotton:

a) determination of germination and germination energy processed in various high-intensity electric fields by different treatment modes compared to the control in laboratory cups;

b) a full cycle of seed treatment, their sowing together with control on beds (more than 80) in a laboratory field with recording of all stages of seed germination, plant development: their weekly growth, the diameter of stems, the appearance and growth of the number of ovaries, flowers, buds, opening of boxes, the total number of boxes on each Bush and the number of opened ones. At the same time, every 20 days, the bushes of plants and beds in General are photographed. Then 2-3 times the harvest is made in paper bags with a record of the number of cotton collected from each Bush of the bed with the date of collection. In this case, the cotton from each box is rewound with a thread, so that the cotton of each box does not mix with other cotton. After the cotton is harvested, the bushes are uprooted and the number and length of the roots of each plant are measured.

After these operations, the amount of cotton collected from each Bush and from each bed is determined. Then, by random selection, 2 groups of 50 pieces of cotton are selected from each bed. For each group of boxes of 50 pieces is a table in which are entered the data of measurements of mass of cotton fibers, the weight and number of seeds, percentage of fiber each cotton bolls. Then, for each group of 50 cotton pieces, the average values of the above parameters are calculated. Then compare the data of other cotton beds, the seeds of which were processed in the same mode. The same is produced by cotton control beds. Based on these data, the effectiveness of a particular treatment regime for seeds of each variety is evaluated;

c) large-scale testing of pre-sowing seed treatment technology in the fields of agricultural enterprises and farms. Based on the results obtained in the laboratory conditions of the results of the effectiveness of a particular treatment regime for wheat, cotton and other agricultural crops, the treatment modes for large-scale (tens and hundreds of tons) seeds for large farms and agricultural enterprises are set. But, keeping in mind the small differences between this crop variety and the seeds tested in the laboratory, as well as to take into account the actual weather conditions at the beginning of work, after about 10-15 minutes, samples are taken from each fraction and the weight of 1000 pieces is measured. A comparison of this data shows how well the processing mode is selected. If necessary, adjust the modes to achieve their effective values. Figure 1 shows a flowchart of factors x1 – X5 affecting the initial seeds, and the resulting main results on the characteristics of seeds.
2.1. Installations for pre-sowing treatment of agricultural seeds in high-voltage electric fields

In addition to purely laboratory purposes for the study of various characteristics of control and treated with different modes of seeds, 2 types of plants were developed and manufactured:

a) for processing small and medium batches of seeds - from one hundred grams to 100 kg, mainly for small farms, for small areas, as well as for greenhouses-small installations;

b) for processing a large array of seeds – from hundreds of kilograms to hundreds of tons – large installations.

We will briefly describe the composition, technical characteristics and capabilities of such installations. Figure 2 highlights a general view of the plant, which mainly consists of a seed feeder.

For rice from the ground or from a vehicle (e.g., the body of a motor vehicle, a tractor trailer) into the hopper of the device; from the hopper for receiving seed and an even flow on the grooved shaft unit; a shaft for supply of seeds on a conveyor belt evenly in a single layer; from the top and bottom conveyor belts, which serve for the movement of treated seed from the hopper to the end of the conveyor belt, and for delivering the seed falling from the upper conveyor to a receiving point of treated seed; from electric motor and gear mechanisms, which serve for driving conveyor belts; from regulated sources of AC, DC and pulse currents of high tension for seed treatment; from means of measuring high voltages and their currents; from high-voltage electrodes for receiving high voltages and influencing seeds in various areas;

Figure 1. Flowchart of factors affecting seeds and the results obtained

Figure 2. General view of one of the variants of a large plant for processing from several hundred kilograms to several tons of agricultural seeds
from auxiliary parts and devices (housing, control panels, stairs and platforms for maintenance, high-voltage cables and others).

The principle of operation of the installation and the work performed by it. Found that using high voltages you can sort the seeds give energy, but in the course of many years of research we have identified that impact on the seeds of cotton, wheat and other crops strong electric fields, AC, DC and pulse currents of a certain intensity, their sequence, time of exposure, and defined technological solutions on one machine at a high speed process is possible to carry out four operations simultaneously and effectively: a) cleaning the seeds from dust, litter; b) sorting of seeds; C) stimulating seeds - giving them additional energy that stimulates the energy of their germination, seed germination and plant development, increasing crop productivity; d) disinfection of seeds, resulting in the rejection of the use of pesticides.

3. Results and Discussions

3.1. Seed Sorting

When analyzing the operation of the plant for pre-sowing treatment of seeds, first of all, you need to pay attention to their sorting. At the same time, the quality of the initial (control) seeds plays an important role. Of course, if the seeds submitted for processing are elite, or 1st class, then there will be little litter in them, although there are also such batches of seeds that according to documents, the seeds must be excellent, or at least good, and in fact, they are at a level significantly below their passport data. Before processing, it is necessary to find out the task – what results the seed owner needs: a) the number of seeds he has is sufficient and he is interested in getting their good, large and heavy fractions. In this case, the installation mode is selected so that only very large, heavy seeds are separated into the sowing fraction, which will have very good germination, rapid and strong plant development; b) the seeds available to him are slightly more than his needs, then during processing it is necessary to allocate all the litter, damaged and very small seeds; C) the number of seeds available to him is not sufficient for his needs. In this case, when they. In this case, when they are processed, only litter and damaged seeds are released, and large, medium and small seeds, after being processed in high-intensity electric fields, will significantly increase their performance, although not to the same extent as in the previous variants, a) and b).

As an example, we will present the results of processing feed wheat in February 2020 on the basis of LLC "AGRO HV". The processed wheat contained a lot of litter, damaged and small grains.

![Figure 3. Type of wheat before processing-control and after processing: 1st fraction, 2nd fraction and waste](image)

Wheats. From the total amount of processed material in 1 ton 180 kg was allocated to waste, in the first, the best fraction was allocated 610 kg, and in the second-intermediate fraction-210 kg of wheat. Type of wheat before processing-control and after processing: 1st fraction, 2nd fraction and waste are shown in Figure 3. Another example. In April 2017, we processed 350 kg of "Bukhara-8" cotton seeds brought from
Gijduvan district of the Bukhara region. Seeds are good. The weight of their 1000 pieces was 116.4 g, as a result of processing and isolation of small seeds, their weight was increased to 122.9 g, that is, by 6.5 g, which is a 5.6 % increase even for such elite seeds. The mass of 1000 pieces of small seeds allocated by the plant to waste was 105.6 g. This shows how this new technology can effectively sort even such elite seeds and present only large and heavy seeds for sowing.

3.2. Germination and Germination Energy of Seeds
Sorting seeds and processing them in high-intensity electric fields allow, as we have shown above, to select the largest intact seeds from the seed mix and give them additional energy to increase germination. Of course, germination, especially in the field, depends on the correct sowing, pre-sowing soaking, soil moisture and a number of other agrotechnological procedures. Research conducted for decades has shown that the germination rate of seeds treated in high – intensity electric fields is significantly higher than that of control seeds that are not treated. As an example, we present data from 2011 on the field germination of a number of cotton seeds in Table 1.

| №  | Variety name | % of sprouted seeds | % of germination growth |
|----|--------------|---------------------|------------------------|
|    |              | control | processed |                        |
| 1  | An-16        | 74      | 89.7      | 21                     |
| 2  | Turon        | 79      | 95        | 21                     |
| 3  | Yulduz       | 84      | 98        | 16.7                   |
| 4  | Guliston     | 71      | 93        | 31                     |
| 5  | L-151        | 77      | 90        | 17                     |
| 6  | L-06         | 81      | 94        | 16.1                   |

As can be seen from the data shown in Table 1, the percentage of germinated seeds in the field in this study for control and different seed varieties ranged from 71 % (for Guliston) to 84% (for Yulduz). For the treated seeds of these varieties, the range of percentages of sprouted seeds was from 89.7 (for an-16) to 98 % (for Yulduz). The percentage of growth in field germination of these seeds ranged from 16.1 (L-06) to 31% (Guliston). Seeds of the Turon, Guliston, L-151 and L-06 varieties were previously presented to us by their author, S. S. Alikhodzhayeva. (Institute of plant breeding - NISSAH) for processing, so they received until this year repeated the action of electric fields of high tension. The high percentage of germination of the Yulduz variety is due to the fact that this variety has been repeatedly processed by us for 13 years, and therefore its characteristics have improved annually. It should be noted very good germination of colored (cinnamon and flax) cotton, also from the Institute of selection, the seeds of which were processed by us and sown on the laboratory site since 2013. So, in 2017 field germination control of these seeds was not lower than 84 %, and processed-in the range of 90.3-97.2 %.

As for the energy of seed germination, it should be noted that the treated seeds, mainly, sprang up 1 - 3 days earlier than the control ones, and they had friendly shoots, which is of great importance for the further strong development of plants.

Long-term research has established that as a result of processing seeds in strong electric fields, they have:
- Increased germination
- Larger size and weight
- Free of impurities, small and damaged seeds
- High energy for germination, for plant growth
- Reduction of the amount of sown material (seeds) by 2-2. 5 times
- Sterile and free from pathogenic bacteria surface, and volume
- Suited for machine sowing of view
3.3. The Growth and Development of Plants: Cotton

Since according to this technology, seeds when moving along the conveyor belt and when they fall down receive additional energy from electric fields of high intensity of direct, alternating and pulsed currents, the growth of their plants, respectively, will significantly outstrip the growth of plants whose seeds have not been processed in electric fields.

Table 2 shows data on the number of flowers by 30.08.2005 and the number of opened cotton pods by 30.09.2005 for 3 varieties of cotton: "9880", "Denov" and "Surkhon" for control and 2 modes of seed treatment. On the same day of 30.08.2005, if the variety "9880" for 4 meters of the bed number of flowers was 377 pieces, then for plants whose seeds were processed by the 1st mode, it was 502 pieces, and the 2nd mode-480 pieces. Accordingly, for the varieties "Denov" and "Surkhon", if the number of flowers for the control was 297 and 501 pieces, then for the processed 1st mode became 460 and 571 pieces, and for the 2nd processing mode: 421 and 449.

| Beds | Number of flowers | Number of opened boxes | Variety | Mode |
|------|-------------------|------------------------|---------|------|
| 28   | 377               | 145                    | 9880    | Monitoring |
| 29   | 502               | 255                    |         | Dir.1 |
| 30   | 480               | 215                    |         | Dir.2 |
| 31   | 556               | 275                    |         | Monitoring |
| 32   | 607.5             | 310                    | Denov   | Dir.3 |
| 33   | 659               | 345                    |         | Dir.4 |
| 34   | 710.5             | 380                    |         | Monitoring |
| 35   | 762               | 415                    | Surkhon | Dir.5 |
| 36   | 813.5             | 450                    |         | Dir.6 |

Table 3. the development of cotton varieties "Bukhara-8", "5706" and colored – brown cotton

| №   | Parameters                      | Bukhoro-8. monitoring | Bukhoro-8. processed | Color. brown | 5706 |
|-----|--------------------------------|-----------------------|----------------------|--------------|------|
|     |                                 | K         | O    | O       | K  | O    | O    |
| 1.  | Plant height                    | 22        | 35   | 49      | 35 | 42   | 50   |
| 2.  | The diameter of the plant       | 3.6       | 5.1  | 7.1     | 4.9 | 6.5  | 7.6  |
|     |                                 | 8         | 1    | 1       | 7.1 | 8.2  | 8.4  |
| 3.  | Number of ovaries               | 0.1       | 4.1  | 7.1     | 2.8 | 5.2  | 7.3  |
|     |                                 | 4         | 1    | 1       | 6.9 | 8.9  | 8.8  |
| 4.  | Number of flowers               | -         | 2    | 2       | 2   | 4    | 1    |
|     | Sown                            | 21.04.2017.|       |         |     | 06.05.2017. | |
|     | Parameter measurement s have been performed | (28-29).06.2017. | (28-29).06.2017. | |

As can be seen from these data, only for the "Surkhon" variety, the 2nd processing mode became negative for the number of flowers. However, as can be seen from the data in the same table, for all cotton varieties listed in this table, the selected processing modes, including mode 2 for the "Surkhon" variety, were good in terms of the number of opened cotton boxes - cotton, which is the main indicator of seed processing. So, if by 30.09.2005 the number of opened cotton boxes of these 3 varieties of cotton for control was, respectively, 145, 152 and 154 boxes, then for the 1st processing mode it increased to 255, 240 and 198, and for the 2nd mode: 215; 205 and 195 cotton boxes. All this shows that as a result of processing the seeds of these 3 varieties of cotton, an increase in the number of opened cotton pods for "9880" was achieved by 76%
under the 1st treatment mode and by 48% under the 2nd treatment mode of their seeds in high-tension electric fields. For the "Denov" and "Surkhon" varieties, the increase in the number of opened cotton pods was 58% and 29% for the 1st mode, and 35% and 27% for the 2nd mode of processing, respectively. In addition, the analysis of the results of seed treatment of these 3 varieties of cotton by the number of opened cotton pods showed that for all 3 varieties, the preferred mode of seed treatment is the 1st mode, which for the variety "9880" by 58%, for "Denov" by 65% and for "Surkhon" by 7.5% seemed better than the 2nd mode. These results were taken into account in the subsequent processing of seeds of such cotton varieties.

Table 3 shows data on the development of cotton varieties "Bukhara-8", "5706" and colored – brown cotton. It should be noted that the "Bukhoro-8" seeds, both controlled and processed, were sown on April 21, 2017, and the seeds of colored cotton varieties were sown only on May 6, 2017. But, as can be seen from the data in table 2, despite the much later, 15 days, sowing, plants of colored varieties of cotton, not only caught up with the development of plants of the "Bukhoro-8" variety, but also significantly outstripped them in development.

Due to the fact that over the past 30 years, we have annually sown control and processed various modes of seeds, as well as complete registration of changes in all parameters of development, growth, flowering dynamics, fruiting, characteristics of the fruits themselves (the number of cotton boxes on each Bush, the weight of cotton, the number and weight of seeds of each cotton box, the percentage of fiber in it, separately for each box and averaged data for each bed, varieties and processing mode – all this for cotton. For wheat – the number of stalks and ears per allocated area, for example, 100x100 cm; 10x10 m and per 1 hectare); the average number of grains in one ear; the mass of 1000 pieces of grains for controlling and processing the crop seeds of each processing mode.

An important factor is that plants whose seeds were processed in high-intensity electric fields have a root length 25-40 % longer than that of control plants. This, on the one hand, just contributes to the faster development of plants with seeds treated with this technology, and on the other hand, this factor is very important for low-water conditions, when long and developed roots contribute to more effective provision of plants with moisture. The complex of favorable factors obtained by plants as a result of processing their seeds in high-intensity electric fields, especially without the use of pesticides, create conditions for their crop to be of high quality. We see this every year by analyzing the characteristics of cotton, wheat and other agricultural crops.

So, it can be stated that as a result of processing seeds in high-intensity electric fields, their plants have:
- Smooth, bald-free early germination;
- accelerated development;
- resistance to low water due to higher germination energy and development of a powerful root system;
- early flowering;
- earlier entry into fruiting;
- increase in the number of boxes on the cotton Bush, the weight of cotton in them;
- increase in the number of shoots during tillering of wheat, increase in grain weight;
- improve the quality of the crop.

Figure 4 shows photos of cotton plants whose seeds were processed in high-intensity electric fields, grown in the laboratory and in the field. It should be noted that in all these cases, the outstripping growth, strength and larger diameter of plant stems, early flowering and fruiting of plants whose seeds were processed by the new technology, compared to the control, were visible even to the naked eye, not to mention the data of all parameters determined by measuring instruments.

Figure 5 shows the histograms of the weight of cotton of the 1st cotton box for the "an-16" variety as a result of the 1st year of processing of their seeds in comparison with the control. The average weight of the 1st box of cotton from the beds with processed seeds, as can be seen from the figure, was 6.27 g, exceeding the weight of the cotton of the control bed by 0.33 g (5.94 g). As can be seen from the graph, if "control" the lower limit of the weight of the cotton has started with the 3.5 g with the unit and ended weighing 8.0 grams, and the main part of the heavy seed was almost emptied to the weight of 7.0 g, then
processed this boundary started from 4 grams with 2 units, and ended 8.5 grams, and the weight of the cotton 7.0 g was 7 units instead of 1 unit, like the control, the weight of the cotton in one Boll "processed" beds 7.5-8.0 g made up by 3 units.

![Figure 1](image1.png)  
**Figure 1. A study of the development of cotton in laboratory and field conditions**

![Figure 2](image2.png)  
**Figure 2. Histograms of cotton weight of 1 control box (left, 5.91 g) and of processed seeds (right, 6.27 g) of an-16 variety (1st year of processing)**

Tables 4 (control and processed) provide statistical data on the weight of cotton, fiber, seeds and the number of seeds per box of cotton of the "Bukhara-6" variety, clearly showing the advantages of the proposed innovative technology of pre-sowing treatment of cotton seeds in high-voltage electric fields. Research of cotton, whose seeds are processed in high-intensity electric fields, in the Ferghana valley if the control box was 7.28 g, then it increased by 0.45 g, i.e. to 7.73 g. The average weight of the fiber of the 1st box of cotton from the beds with processed seeds increased to 2.80 g from 2.63 g for the control. Accordingly, the average weight of seeds and the average number of seeds per box of cotton with treated shrub seeds were: 4.92 g and 38.28 pieces, compared to 4.65 g and 36.38 pieces for cotton with untreated seeds.

The results of measurements and their analysis, shown in Tables 4 and 5, reveal a number of interesting and useful advantages for agricultural production of the proposed new innovative technology. Thus, the standard errors of the parameters of the average values of cotton 1 box, such as: the weight of cotton, the
weight of fiber, the weight of seeds and the number of seeds in untreated seeds, were, respectively, 0.16; 0.07; 0.09 and 0.74, while for cotton with seeds processed in high-intensity electric fields, the standard errors decreased to 0.13; 0.05; 0.08 and 0.71. In this case, the standard deviation of the parameters of the average values of one box of cotton plants with processed seeds decreased, respectively, from 1.1; 0.46; 0.66 and 5.21 to 0.89; 0.35; 0.56 and 5.0.

Table 4. Statistical data on the average weight of cotton, fiber, seeds and the number of seeds per box of cotton of the "Bukhara-6" variety: control and processed

|                      | Control | Processed |
|----------------------|---------|-----------|
| Cotton weight        |         |           |
| Fiber weight         | 7.28    | 2.63      |
| Seed weight          | 4.65    | 4.65      |
| Number of seeds      | 36.38   | 36.38     |
| Cotton weight        | 7.73    | 7.73      |
| Fiber weight         | 2.80    | 4.92      |
| Seed weight          | 4.92    | 4.92      |
| Number of seeds      | 38.28   | 38.28     |
| Strange error        | 0.16    | 0.16      |
| Median               | 7.50    | 7.50      |
| Fashion              | 8.00    | 8.00      |
| Standard deviation   | 1.10    | 1.10      |
| The sample variance  | 1.22    | 1.22      |
| Excess               | 0.81    | 0.81      |
| Asymmetrical drape front. - | -1.03 | -1.03 |
| Personality          | 4.90    | 4.90      |
| Interval             | 4.10    | 4.10      |
| Minimum              | 9.00    | 9.00      |
| Maximum              | 364.0   | 364.0     |
| Amount               | 50.0    | 50.0      |

Figure 6. Colored cotton

The reduction of the interval between the minimum and maximum values of parameters and their bias towards the growth of their data should be particularly emphasized. If the interval of the average weight of cotton of one box of untreated beds was 4.9 g—from 4.1 (minimum average weight) to 9.0 g, the corresponding values of these parameters in the treated beds ranged from 6.0 to 10.2 g (maximum average weight), that is, cotton with treated seeds does not have values with a weight below 6.0 g, and the maximum values increased from 9.0 g to 10.2 g. The same very useful results can be seen from measurements of fiber weight, weight and number seeds, as well as their analysis, shown in Tables 4. The increase in the number of cotton pods on cotton bushes, the increase in the mass of cotton in plant pods, their early opening and maturation, makes cotton bushes, the seeds of which were processed in high-
voltage electric fields, fascinating, compared to cotton bushes, the seeds of which were not processed by this technology.

Table 5. Comparative data of the cotton crop, the seeds of which were processed in high-intensity electric fields, as well as "Visol", compared to the control in the farm “Said Ovul”

| Processed method | Control and processed in different ways | Total number of boxes per 0.1 ga | Average number of boxes | Crime detection, % | Total number of boxes per 1 ga | Average weight of cotton 1 box, g | The cotton crop on 1 ga/ts | Increasing seed yield, % |
|------------------|----------------------------------------|---------------------------------|-------------------------|-------------------|--------------------------------|--------------------------------|---------------------------|------------------------|
| Control          |                                        | 5201                            | 472.8                   | 54                | 520100                         | 5.2                            | 27.0                      | 0                      |
| The visol        |                                        | 5876                            | 534.2                   | 62.8              | 587600                         | 5.1                            | 30.0                      | 11.1                   |
| High voltage     |                                        | 6741                            | 612.8                   | 68.4              | 674100                         | 5.6                            | 37.8                      | 39.8                   |

In addition to increasing the average weight of cotton per box by more than 1.5 g for 3 years of processing their seeds, compared to its original weight (before processing), respectively, increasing the weight and proportion of fiber in cotton, improving the properties of seeds, colored cotton has become more tender, attractive in color (Figure 6), its fibers have become longer, thinner and stronger.

Table 6. Measurements of the parameters of cotton development carried out on the same farm “Said ovul” on an area of 10.36 ha for treated in high-intensity electric fields, and on an area of 32.52 ha for control and for treated with Visol 2, Visol 3, stimulant C-1, Aquamix and Biopreparation

| Processed method | Planted location, ga | 1 hectare of greens-the average total number | Average weight of cotton in 1 pcs breast, g | Cotton opening % 08.09. 22.09. 14.09. 27.09. | Average number of burrows in 1 boxes | Yield and time again ts/ga |
|------------------|----------------------|---------------------------------------------|--------------------------------------------|-------------------------------------------|-------------------------------------|-------------------------|
| Control          | 8.86                 | 520100                                      | 5.2                                       | 45                                        | 67                                        | 8.6                     | 32.3                   |
| Visol 3          | 3.0                  | 587600                                      | 5.1                                       | 49                                        | 62                                        | 8.8                     | 32.6                   |
| High voltage fields | 10.36              | 674100                                      | 5.7                                       | 96                                        | 100                                       | 13.1                    | 45.4                   |
| Visol 2          | 3.43                 | 637175                                      | 5.2                                       | 46                                        | 54                                        | 7.2                     | 33.1                   |
| Stimulator S-1   | 3.46                 | 601425                                      | 5.6                                       | 43                                        | 50                                        | 10.9                    | 33.7                   |
| Equamix??        | 10.0                 | 560175                                      | 5.2                                       | 23                                        | 31                                        | 7.0                     | 29.1                   |
| Biopreparat      | 3.77                 | 595925                                      | 5.0                                       | 44                                        | 48                                        | 8.1                     | 30.1                   |

We did a lot of research on the impact of high-intensity electric fields in the farm "said ovul", located in the Sredne Chirchik district of the Tashkent region. Some of these results are shown in Tables 5 and 6. Table 5 shows comparative data of the cotton crop, the seeds of which were processed in high-voltage electric fields, as well as "Visol", compared to the control. As can be seen from these data, if the total number of bolls per 1 ha in cotton seed which has been treated in the electric fields of high tension, made 674100 pieces, then the control 520100 pieces, and cotton, whose seeds were treated with the drug "Visol" - 587600 pieces, that is, the number of cotton bolls, the seeds of which were processed in the electric field is increased compared to control at 30 %, as compared to processed "the Visol"-om – 14.7 %. If the average weight of cotton 1 boxes the control was 5.2 g, and treated of "Visol"th 5.1 g, then processed in the fields of high tension weight 1 cotton bolls made up of 5.6 g, that is, each cotton bolls increased by 0.4 g compared to control and 0.5 g compared to treated "the Visol"th. As a result, the yield of cotton, if the control was 27.0 C / ha, in the processed " Visol»- om 30.0 C / ha, then treated in high-
intensity electric fields, it increased to 37.8 C/ha, that is, compared with the control – by 39.8%, and for "Visol" - at 28.7%.

Measurements of the parameters of cotton development carried out on the same farm “Said ovul” on an area of 10.36 ha for treated in high-intensity electric fields, and on an area of 32.52 ha for control and for treated with Visol 2, Visol 3, stimulant C-1, Aquamix and Biopreparation are shown in Table 6. As follows from these data, in all cases, the parameters of the development of cotton, the seeds of which were processed in electric fields were significantly higher than in the control and treated with the above-mentioned preparations. It should be noted that, if on September 8, the opening rate of cotton pods in the control was 45%, and in cotton treated with 5 types of drugs was in the range of 23 to 49%, then in cotton with seeds processed in electric fields, it was 60%. By September 27, the opening rate of cotton pods in cotton with treated seeds in electric fields was all 100%, while in control and in treated with drugs, it was generally no higher than 88%, only in cotton with treated seeds with Visol 3, it reached 94%. The yield of cotton in cotton treated in high – intensity electric fields was 45.4 C/ha, and in control-32.3 C/ha, in treated with all 5 preparations, did not exceed 33.7 C/ha (Stimulator C-1).

3.4. The Growth and Development of Plants: Wheat

During all this time, in parallel with studies of the impact of high-intensity electric fields on cotton seeds, on the growth and development of its plants, on increasing productivity and other characteristics, research was conducted on the impact of these fields on wheat, both in the laboratory and in the field. Figure 7 shows the development of wheat plants whose seeds were processed in these fields. As for cotton plants, wheat plants developed tall and strong, with a large diameter of stems, which is especially important for wheat grown in our region, where every year at the end of April – in the first decade of may there are strong winds that cause mass occurrence of their plants. This phenomenon is especially dangerous for the plants that lie down because these strong winds at this time of year are accompanied by heavy rains, which lead to rotting of not hardened wheat grains. In the acts about the results of seed treatment of wheat in the electric fields of high tension, signed by the heads of State Corporation "Kim pen Hwa" Medium Chirchik district of Tashkent region Madiarova T. M., dehkan farms "Turkiston" and State farm "Tukimachi" Zangiota district of Tashkent region underlines this important aspect treated in the electric fields of wheat seeds. In addition, in all these acts the figures about the increase in the number of shoots at tillering of wheat, early ripening (for 12-20 days), the growth in the number of grains per spike (14-25 units), the growth of the mass of each grain (by 18-22%) and the absence of disease during plant development and that the process of growing wheat, from the processing of seeds and ending with the collection and storage of harvest, applies no pesticides, therefore the harvest was absolutely ecologically clean.

Figure 7. Study of the development of wheat plants whose seeds are processed in high-voltage electric fields

Studies of the impact of high-intensity electric fields on seeds and on the development of wheat plants on a large scale were also carried out in the above-mentioned farm "Said Ovul". The main results of these studies are shown in Table 7. As it can be seen, the average number of ears on an area of 1 ha for seeds
processed in electric fields increased to 2,765,000 compared to 2,600,000 pieces of control ears, the average number of grains in each ear of processed seeds increased to 54.5 pieces compared to 41.6 for control, the weight of 1000 pieces of grains also increased to 42.6 g compared to 37.8 for control. As a result of all these increases, the yield of wheat in this farm increased by 58.13 % (64.2 C/ha) compared to the control (40.6 C/ha).

Table 7. The main results of processing wheat seeds in electric fields of high tension in the farm "Said Ovul", Tashkent region

| Type of seeds                                      | Average number of ears per 1 hectare | Average number of grains per ear | Weight of 1000 pieces of grains in g. | Yield, t/ha | Increase in productivity |
|---------------------------------------------------|--------------------------------------|---------------------------------|--------------------------------------|-------------|-------------------------|
| Control, before sowing the seeds are treated with pesticides | 2 600 000                            | 41.6                            | 37.8                                 | 40.6        | 0.00 %                  |
| Processed in electric fields of high intensity without the use of pesticides | 2 765 000                            | 54.5                            | 42.6                                 | 64.2        | 58.1 %                  |

Based on the above results of years of laboratory and field studies on a large scale, we can conclude that, if the proposed innovative technology of presowing treatment of seeds in electric fields of high tension, at the same cost of irrigation water, fuel and lubricants, labor, you can get a significantly higher number of harvest (for the cotton more than 25 %, wheat 40 %), consequently, reduced consumption of these materials and resources in the same interest. In addition, as we noted above, all processes in this technology exclude the use of pesticides, starting from pre-sowing treatment of seeds with pesticides. Anding with the treatment of plants, which allows you to save not only on the purchase of a large volume of pesticides, but also to protect people, the earth and the surrounding air from infection with very dangerous poisons.

4. Conclusions
The advantages of the proposed innovative technology of pre-sowing treatment of cotton, wheat and other agricultural crops in high-voltage electric fields and using new technological solutions are shown:
- This technology allows you to increase the yield of agricultural crops, for example, for cotton by at least 25 %, for wheat – at least 40 %.
- Allows you to improve the quality of the crop (for example, for cotton: increasing the proportion, strength and length of fiber; for wheat: increasing gluten).
- Acceleration of crop maturation by 12-20 days, depending on the type, variety of plants and climatic conditions of the area.
- Reducing the amount of seed material (seeds) by 2-2.5 times.
- Getting an environmentally friendly crop.
- Excluding the use of pesticides, plant diseases and crops.
- Preventing contamination of personnel with pesticides, preserving the clean ecology of the earth and air.
- Significant savings in fuel and lubricants, irrigation water and labor.
- The Possibility of obtaining 2 wheat-cotton harvests per year by reducing the growing season.

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