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ELECTROTECHNOLOGICAL TREATMENT OF DISEASED FRUIT TREES

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Abstract: This article discusses the theoretical foundations, technological solutions and effectiveness of using electro technological methods to eliminate diseases in fruit trees. Scientific analyses of the effects of electric field, pulsed current and electro plasma technology on plant physiology, in comparison with traditional chemical treatment methods, are presented. The studies demonstrate the environmental safety, minimal resource consumption and high efficiency of electro technological treatment.

Keywords: electrotechnology, pulsed electric current, electric field, cold plasma, electroporation, pathogens, agrotechnology, electrostatic sprayers, disinfection.

Introduction. Fruity trees agroecosystem important from components one to be, their healthy growth village farm to productivity directly impact shows. Currently plant diseases types increase, to them against in the fight chemical fungicides and pesticides wide is used. However chemical from tools excess use biological diversity to the reduction of soil degradation, in fruits harmful of substances to gather reason will be. Last in years ecological clean and energy economical technologies working exit according to scientific research is increasing. So promising from directions one is electro technological processing to give is, it is electric from energy using plant pathogens against to fight in mind Electro technological methods high in tension electricity from the field, low frequency or impulsive from the current, plasma from the stream or ionized particles from energy uses. This methods pathogen microorganism's disinfection, disinfection immune system reinforcement and physiological processes activation opportunity gives.

Fruity tree diseases main types and their damage to deliver mechanism. Fruity in the trees occurring diseases usually three to the group is divided into:

Fungal diseases, Bacterial Diseases, Viral diseases.

These are the widest widespread apple, apricot, cherry, peach and grapes such as in the trees often occurs. Main species: mushroom spots, powdery mildew, moniliasis, black cancer, fruit They are the tree's leaves, stem or to the fruit enter the cell membrane eats, feeds to the exchange interference Bacterial burn, bacterial cancer, leaf stains these Bacteria fast increases and plant tissues Poisonous. Mosaic, aster, leaf bending such as viruses plant immune system weakening take Treatment very difficult but traditional tools with fungicides, antibiotics, insecticides, agrotechnical events passing The bride is coming. The problem chemical of resistance appearance to be, ecological danger, expensive expenses. Therefore alternative technologies necessary is happening. Alternative from technologies using electro technological in a way processing to give scientific from the basics we use.

Electrical engineering — wiring or to pathogens known physical-energetic impact show through the disease reduce or no to do the following is a process. physics to the processes. Relying on: Electric of the area impact, impulse electricity until it's cold plasma technology, thermal-electric effect .

Electricity area cell on the membrane electroporation process to the surface Pathogens cell wall weaker since it was, they faster are damaged. Impulses very short

(microsecond) duration will, but voltage high. As a result, pathogens protein structures broken, virus capsid decomposes, the plant physiological activity centers are encouraged.

Ionized plasma flow following to the effects has bacterial and fungal spores oxidizes and no does plant on the surface microflora makes you healthy fruit and leaf on the surface's disinfection does. Plant in the tissue heat divorce happened will be, but control under that was because of to the tree damage does not deliver.

Electro technological processing to give methods in practice application and vine conductor electrodes through processing to give. Tree to the body two electrode connects and low frequency vine This is the xylem. and in the phloem the movement activates pathogens neutralizes the tree immunity increases. Electrostatic Sprayers. Chemical solutions not, maybe electrostatic charged microions They are used as a plant. on the surface equal distributed and fungal spores no does. Impulsive electricity area with processing (PEF). This method fruitless in the period tree to the body is used. As a result, diseases decrease, new buds output activates, produces quality high It will be cold. plasma with disinfection. This method especially following in cases effective. Viral diseases, bacterial burn, leaf spots, private in the gardens high environmental requirements was in the regions.

Electrical engineering Advantages: Ecological safety. Chemical from substances not used, natural to the environment damage Cheap and energy economical. Low voltage vines with work possible. Equipment simple and service show easy. High to efficiency has.

Research this shows that (different scientific to sources according to): kills bacteria up to 95%, fungal spores up to 80–98% neutralization possible. In this case, the plant natural immunity activates. Electricity stimulation as a result plant following processes enhances: photosynthesis, nutrition substances metabolism, stress endurance, root growth acceleration. Harvest quality and preservation improves. Pathogens decreased for fruit quality indicators improves. Electrotechnological of methods restrictions and security measures as follows.

Technical equipment required, voltage wrong if given tree texture injury possible. Continuous monitoring is necessary. Security Measures: Experienced expert by transfer in humid conditions high voltage with work recommendation. The plant is not available. by age, by type suitable regime is selected.

Practical example : apple in the trees electro technological processing to give

Research results. The results of the study show that PEF reduces nematodes in infected almond trees by 70-80% and increases yield by 20%. In grapes, electrical treatment increases root formation by 95-97%. In citrus, electrical signals indicate water and light-dependent changes, identifying stress early. The discussion emphasizes the importance of optimal adjustment of parameters (voltage, frequency). High voltage can be harmful to cells. In the future, individual adaptation through AI models is proposed.

Electrical impedance spectroscopy (EIS) is used to assess the internal condition of trees. Impedance is measured using high-frequency signals (2-100 kHz) and disease or decay is detected. In apple trees, EIS provides early diagnosis of decay of shoots by increasing the impedance by 2-3 times. Electroculture methods, such as the creation of electric fields through copper wires and magnetic coils, accelerate root growth in affected pear trees by 50 cm.

In grapevine shoots, electrical treatment affects the tissues, changes the equivalent circuit properties and accelerates root formation by 15-24%. In citrus fruits, electrical vibrations are used to assess damage, which optimizes harvesting processes. The literature shows that electrical technologies are environmentally friendly compared to chemical methods, but field studies are insufficient.

Apple trees often red spot, black cancer and moniliasis with 30 trees are damaged. made experience the following showed:

Indicator	Chemical tool with	Electrical engineering with
Disease decrease	45–60%	80–95%
Ecological security	Low	High
Fruit quality	Average	High
Expenses	High	Average /low

Results electro technological processing advantage confirms.

The results of the study show that more than two-thirds of textile and garment fabrics can be produced by laser engraving machines to create various digital patterns (Figure 3). The traditional textile fabric production process requires post-processing such as grinding, ironing, embossing, etc., while the laser engraving machine has the advantages of easy production, fast, flexible pattern change, clear image, strong three-dimensional feeling in this regard. It can fully express the original color texture of various fabrics, as well as the advantages of eternal novelty. When combined with the hollow process, it perfectly complements each other. It is suitable for clothing fabrics and laser embroidery.

Using lasers, the process is more efficient and environmentally friendly than traditional methods. It reduces water usage by up to 95% and eliminates the need for toxic chemicals typically used in distressed denim. In addition, jeanologia laser technology allows for customization and personalization of denim products, providing flexibility for brands and consumers. It also helps reduce production time and costs and ensures consistent quality. Overall, jeanologia laser technology is revolutionizing denim production by combining sustainability, efficiency, creativity and customization in the fashion industry.

Fruit tree damage is a global problem caused by diseases, pests, mechanical damage and environmental factors (drought, frost) and can reduce yields by 20-50%. Traditional chemical and mechanical methods are environmentally harmful and economically inefficient. Recent studies have shown that electro technological methods, such as electrical pulse treatment, are an effective alternative by activating plant defense mechanisms. These methods, through non-thermal action, modify cell membranes, destroy pests and stimulate regeneration processes. For example, the use of electrical pulses against nematode diseases in almond and tomato trees reduces the disease by 70-80%. This article analyzes the scientific basis of electro technological treatment of damaged fruit trees (apple, pear, grape, almond), evaluates the methods and results based on existing research. The goal is to show the prospects of these technologies in agriculture. The system saves energy, reduces water and chemical consumption, reduces processing time and overall production costs: respecting the environment, reducing manual labor and protecting the health of operators are the main objectives. The software ensures maximum flexibility thanks to constant updates that always add new options.

Conclusion. Sick. fruity to the tree's electro technological in a way processing to give traditional chemical struggle to the methods relatively many to the advantage has is ecological safe, economical in terms of economical and high effective technology Electricity area, impulse vine and cold plasma plant physiology positive impact because of pathogens fast is neutralized, the tree immunity increases and productivity noticeable increases. Future scientific research optimal parameters of electrical technology identify, new equipment create and him/her wide extensive gardening on their farm's application according to orientation necessary.

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