**P-013** **Nanochips for presowing seed treatment by capsulation**

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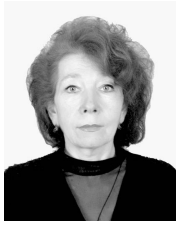

## INTRODUCTION AND OBJECTIVE

***Engineering: from the lab to the manufacture***
In the sphere system of ecologic plant protection, research and development of new approaches and modern inoculum preparation techniques play an important role. The most perspective first-priority approach in modern world agriculture practice involves stimulating plant resistance to diseases and vermin through innate plant immunity (as with humans and animals). This approach is the most rational, effective enough and environmentally appropriate method of cultivated plant protection from pathogens and insect pests (Tjuterev L. 2002; Heng Y. 2010).

The problem of using elicitors (immunostimulants, immune response modifiers and immunomodulators) based on environmentally friendly natural constituents is even more pressing by reason of fungicide short "activity period" and high level of phytopathogens adaptability to existing preparations.

Unlike pesticides (chemical agents) elicitors (biopesticides) do not form pathogen habituating; elicitor application is an infallible method of plant disease prevention. Chitosan is widely known as one of such eliciting compounds (Tjuterev L. 2002; Heng Y. 2010).

Our research objective is to study effects of polyfunctional, multicomponent (nano) chips based on biopesticides, particularly chitosan derivatives, on the growth and development of oil-yielding cruciferous crops by applying environmentally appropriate presowing seed treatment (nano) technologies.

## MATERIALS AND METHODS

(Nano) chips for presowing seed treatment by capsulation consist of organic mineral with high sorptive capacity – (nano) absorbent material. (Nano) absorbent contains elicitors and other physiologically active substances within the composition of durable action (nano) systems. Such absorbent is used as an additional source of plant nutrition microelements, moisture "micro depot", soil conditioner and detoxicant for agroecosystem phytosanitary stabilization (Ruban I. 2011).

Presowing seed treatment (nano) systems have been obtained by successive mixing of the components in water solution, at different ratios and in various concentrations.

On the basis of the general extent of presowing rapeseed treatment technique the mixing have been performed in accordance with multicomponent system (nano)structure-forming method (Karpachev V. 2008).

Seed surface was sequentially processed with the components of developed (nano) chip - forming systems and then the seeds slightly dried. Thereupon an estimation of (nano) structures retention rate was conducted in accordance with seed shedding estimation method.

In compliance with conventional methods laboratory experiments were conducted using Petri dish and filter paper. Field tests were carried on the fields of State Research Institution, All-Russian Rapeseed Research Institute, Russian Academy of Agriculture. Seed germinating power and laboratory seed germinating capacity valuation was made under the standard methods.

Germinant length (sprout and roots), green, dry and general weight have been measured. The plant growth and development dynamics at early ontogeny stages was also determined during our experiment. The results of our research have been photographed and then summarised in tables, diagrams and figures.

Under the general research framework the experiments were conducted in 4 repeatabilities: untreated seeds (control); seeds treated with a protectant used in production; seeds treated with a protectant used in production with the application rate lower; seeds treated with insecticide used in production; seeds treated with insecticide used in production with the application rate lower ; seeds treated with certain (nano) system components; seeds treated with different component combinations through ratio and concentration variation within physiologically active polyfunctional (nano) systems - (nano-chips); seed treated with various components through ratio and concentration variation within physiologically active polyfunctional (nano) systems, simultaneously with protectants and insecticides used in production with lower application rate.

## RESULTS AND DISCUSSION

As the conducted research has shown, depending on the composition of (nano) chips applied for presowing rapeseed treatment, seed germinative energy and laboratory germination capacity increased from 95 % in control (untreated seeds) to 100%.

More than that depending on (nano) chip composition the length of rapeseed germinants (roots and sprouts) varied considerably (fig. 1 a, b). It should be also noted that some of nanochips stimulated rapid sprouts growth; other stimulate d roots growth; and only several of them influenced both roots and sprouts.

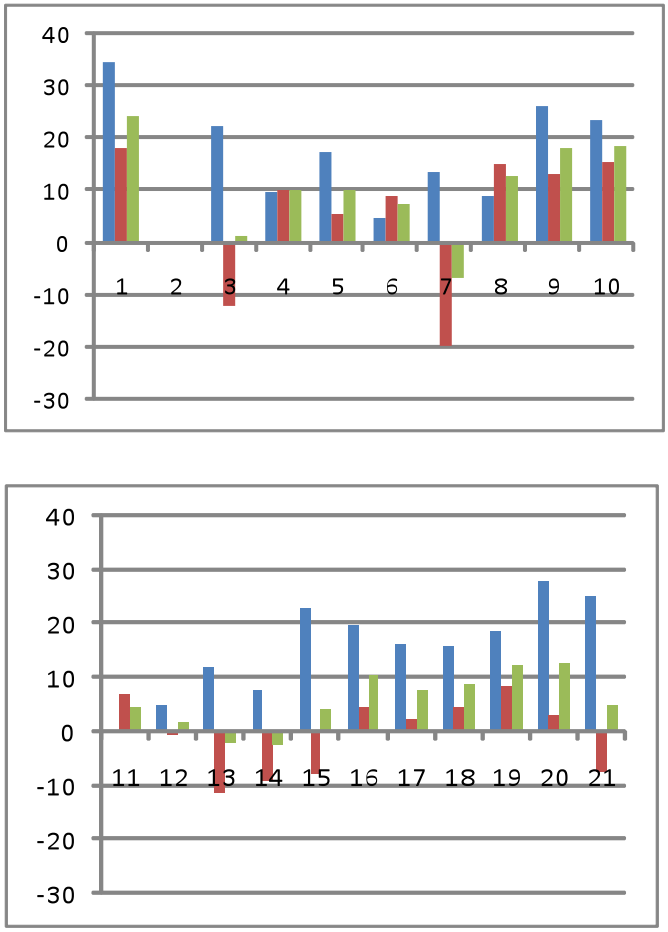


**Fig.1a,b Germ length roots, Germ length sprouts, Germ length increases ( 2-control),%**

Germ green and dry weight accumulation indices (roots and sprouts) also differentiated in relation to (nano) system composition applied on seeds during their presowing treatment (fig. 1 a, b).

## CONCLUSIONS

Thus, depending on concentration rates and coating methods the most effective polyfunctional and physiologically active (nano) systems – (nano) chips of various compositions, including natural polysaccharide and oligoaminosaccharide derivatives and minerals, were singled out for presowing seed treatment by (nano) technologies.

Moreover, the advantages of developed modern and environmentally appropriate polyfunctional physiologically active (nano) systems – (nano) chips have been revealed in comparison with the samples.

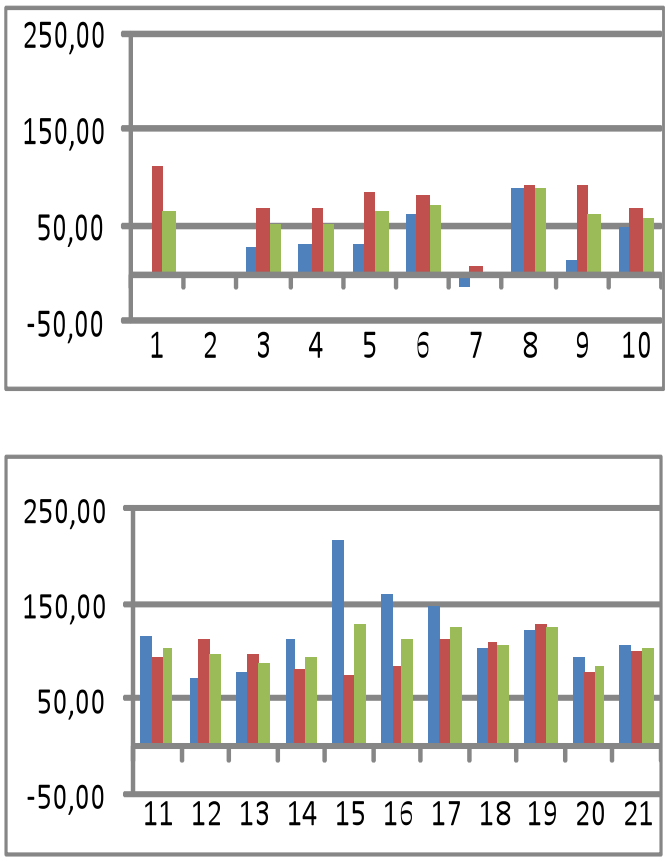


**Fig.2 a,b Germ weight roots Germ weight increase sprouts, Germ weight increases ( 2-control), %**

These advantages mainly consist of stable (nano) system – (nano) chip retention on the seed surface, seed sowing quality improvement (growing and germination capacity increase, germ green an dry weight accumulation (roots and sprout), cultivar growth and development stimulation in early ontogeny stages). The most efficient composition have been tested in plot factor experiments.

## REFERENCES


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