

Polymers use in technology of rice seeds preparation to sowing

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Introduction

Analysis of investigations which have been carried out shows the wide possibilities of plural-component polymeric systems including water-soluble polymers - plants growth and development regulators and plant protection means against phytopathogenes and weed plants in the technology of seeds preparation to sowing by capsulation method [Irnazarov I. et al., 2000, Sharipov M. D., 2000, Sharipov M. D., 2001, Sharipov M. D., 2001, Sharipov M.D., 2002, Ruban I.N. et.al., 2006). If the particles size, possessing biological activity as well as rice seeds rind pores, are in the range of some tens nanometers, then it is possible to propose that seeds capsulation technology is to be considered as nanotechnology. In this case nanoproperties of such covers consist in the increase of capsulated seed stability in unfavourable conditions of environment.

Main goal of this investigations is the search effective multi-component polymeric systems, consisting of water-soluble polysaccharide derivatives, feeding microelements, plant growth regulators and herbicides under treatment of rice seeds.

One of investigation task is the selection of polymeric systems components and their expenditure rate, carrying out laboratory vegetation and field experiments.

In laboratory and vegetation experiments it was shown, that layer-by-layer rice seeds capsulation with polymeric preparative forms (PPFG) containing herbicide Gulliver in dose 105-110 g/t promotes the young growth and rice plants sprouting. Subsequently PPFG influence on growth, development and rice plant acceleration were studied in field conditions. The highest field sprouting was noted on 4-th variant and was 60 plants on 1m², as compared to control -320 plants on 1m². High field spouting was also noted on 2-nd and 3-rd experiment variants. Slight lower spouting was in 6,7,8,9 variants, only insignificantly exceeding control in 10-th and 11-th variants field spouting was lower, than control, as well as in the other experiment variants.

It's specified possibly with insignificant suppressing of field spouting by herbicides on the early stages of rice plant development. Steeping of seeds in Roslin and ME solution leads to some increase of field spouting caused by their stimulatory effects. In the course of weed plants quantity (large fruit) accounted it was established that the largest quantity was registered in the experiment control (281 pcs. on 1m²) and the least - 61,70,73,81 on 1m² and in 11,10, 9,8 experiment numbers. Significant decrease of weed plant quantity as compared with control was noted in 4,5,6 variants.

The highest PPFG efficacy on suppressing of weed plant is observed in the variants with seeds layer-by-layer capsulation where plural-component systems were used with inclusion of feeding elements, growth stimulators and Gulliver in quantity 105-110 g/t of seeds.

In this case the difference in Gulliver concentration (105-160 g/t of seeds) did not influence significantly on weed plants suppressing, that allows to recommend the smaller quantities of expensive preparation and get economical efficacy.

It is confirmed by early obtained results on investigation of PPFG influence (sticky substance Trend-90 was used) in quantity 105-110 g/t of seeds.

In the other experiment variants on weed plant suppressing were much lower as compared with above described. Important index at the use of multifunctional systems for seeds treatment is plants growth especially on the earlier stages of development.

Material and Methods

In this investigations rice “Avangard” variety was used. “Avangard” variety (Authors Pulina, Rixsieva) was generated by hybridization of Uzbek variety 5 x laboratorio 3 (Portugal) with vegetation period 118-120 days. Stem high 115- 120 sm grouts yield 71-72 %, whole nucleus content -95%. This variety is stable to lying and falling.

The plants were treated with the next systems

Control without treating

1. Roslin (stimulator), wetting 1l/t seeds in accordance with expenditure rate in the list of permitted to use preparation in APC RUz on 2005-2009.
2. NaCMC, (capsulation, 2% solution 20 l/t of seeds according to instruction on agriculture seeds treatment with film-forming composition).
3. Treatment (wetting) with feeding microelements (molybdenum and manganese salts) in accordance with instruction on presowing agriculture seeds treatment.
4. Nomini (80 g/h) treatment by sprinkling of rice young growth on 3-4 leaf plants, in accordance with recommendation on Nomini use as herbicides on rice crops.
5. Gulliver – treatment by sprinkling of rice young growth in 3-4 leaf phase in accordance with recommendation on Gulliver use as herbicides on rice crops (Du Pont firms).
6. Gulliver (seeds treatment by calculation 105 g/t of seeds with Trend-90) addition according to before determined optimal quantities at the rice seeds treatment.
7. Gulliver (seeds treatment by calculation 110 g/t of seeds work Trend-90) addition according to before determined optimal quantities at the rice seeds treatment.
8. Treatment by layer-by-layer capsulation (1-st layer – sum of microelements -50 g/t of molybdenum salt and 450 g/t manganese salt with NaCMC (2% solvent, 20 liters of working solvent 400 g/t; second layer – Gulliver (110 g/t of seeds with NaCMC (1% solution, 250 g/t).
9. Treatment by layer-by-layer capsulation (1-st layer – sum of microelements -350 g/t of molybden salt and 450 g/t manganese salt with NaCMC (2% solvent, 20 litres of working solution on 1t of seeds 400g/t); 2-nd layer Gulliver (110 g/t of seeds) with NaCMC (1% solution, 200 g/t).
10. Treatment by layer-by-layer capsulation (1-st layer – sum of microelements -350 g/t of molybden salt and 450 g/t manganese salt with NaCMC (2% solvent, 20 litres of working solution on 1t of seeds 400g/t) and Roslin – 1 l/t of seeds 2-nd layer - Gulliver (110 g/t of seeds) with NaCMC (1% solution, 200 g/t). Registration and observation were carried out in accordance with Uz N11 Z n instruction. 1986

For laboratory and vegetation experiments capsulation was carried out in pelletor.

Results and Discussions

Growth and development are the most important manifestations of organisms life activity (Demalon, Nichiporovich, Rubin, Ovcharov, Kurbanov, Kadirov, Rakhimov et al, Javliev). Rice seeds capsulation with PPFG influences definitively on the stem growth and its height. We investigated in field experiments the influence of plural-component systems on growth indices of rice plants. In all the variants of experiment plants height forestalls the control values, especially in the variants of seeds soaking in Roslin and ME sum. Just lower plants height was observed in the variants of rice seeds treatment with the use of layer-by-layer capsulation method with plural-component systems. In this case markedly growth inhibition by herbicides has observed as well as no difference of the Gulliver action depending of its concentration in PPFG was noticed.

Not less significant indices of herbicides action on rice plants development is dynamics of rice plants dry mass accumulation, especially in the earlier phases of young growth and stooling. We investigated PPFG influence on this process and showed that seeds treatment with stimulators and ME sum promoted the significant increase of plants dry mass as compared to control.

Layer-by-layer capsulation with multi-component systems promoted the increase of dry mass especially in shrubing phase. It means that to this time herbicide action in composition of polyfunctional system on the development, of rice plants is fully absent and all this system show simulating action and it is seen under the comparison with the efficacy of growth and development stimulators as well as feeding ME. Besides, in the studies of dry substance accumulation parameters also the principal difference in the action of various Gulliver herbicides components was established. The main result of the investigations is to obtain high rice harvest. In this course the size and grain content of whisk, grain weight from one plant, mass of 1000 grains and percent of empty ears are the most important biometric indices.

Rice plants productivity also characterized by whisk sole and its grain contents. Grain mass from one plant is non-stable index, depending on many factors of rice growing. In many cases it may be increased significantly influencing on the seeds before sowing and vegetation period on plants by various biogenous selective substances.

When investigating of polyfunctional polymeric systems influence on growth and development of rice plants and their biometric indices it was shown that before-harvesting plants number on 1m² varied in wide limits.

The most % grain-empty ears was noted in the control variant of experiment -15.2%. Low indices were also recognized in experiment variants with the use of plural-component systems. Here, significant difference was established when using of Gulliver various concentration in PPFG in the course of presowing seeds treatment.

Low indices of empty graininess were also noted with use of Roslin, NaCMC and ME sum – 10,3,10,8, 11.8% mass of 100 grain does not differ significantly in experiment variants. Thus, all the systems investigated showed rather high effectivity that was expressed in decreasing of weed plants and empty graininess decreasing. Because all herbicides used disturb the exchange of substances, dynamics of growing and organ-forming processes it could be expect that the methods of PPF herbicide containing introduction, we proposed would influence on harvest formation.

It is seen from table that harvest increase, depending on PPFG composition vary as compared to control on the range from 15.0 c/h to 18.7 c/h. The highest result was obtained in the case of layer-by-layer seeds capsulation with multifunctional polymeric system. The use of herbicide in the used discharge level does not influence negatively on rice culture harvest.

Conclusions

Efficacy also does not depend on Gulliver herbicide concentration. Thus, layer-by-layer capsulation with plural-component polymeric systems, consisting of growth and development regulators, polymeric binding – NaCMC and Gulliver herbicide promoted the improvement of main indices of plants and development, field sprouting, dry substance accumulation dynamics and rice culture harvest. At the same time these systems and layer-by-layer capsulation method allowed to decrease significantly amount of weed plants. The rice seeds stability to unfavourable factors of environment, without of losses of sowing quality evidence the possibility to consider the technology of rice seeds capsulation in nanotechnology context.

In conclusion we express our deep acknowledgement to author of seeds capsulation technology academician S.Sh.Rashidova.

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