

RESEARCH REPORT

Novochizol treatment of Spring wheat seeds, 2020

The two experiments testing the effects of Novochizol seed treatment, were carried under laboratory conditions, using Spring wheat, variety Novosibirsk 31, 2019 harvest.

Each experiment included the following :

1. Control (No treatment of seeds)
2. Novochizol 0,1%,
3. Novochizol 0,05%

These experiments were conducted in the laboratory of Plant Protection of the Siberian Federal Agrobiotechnology Research Center of the Russian Academy of Sciences, headed by Natalia G. Vlasenko, Russian leading scientist in plant protection and green biotechnology (published over 400 scientific papers, including 20 monographs. Author of 8 patents.)

<https://www.sbras.ru/en/organization/36799>

Experiment 1

Objective: assess the growth-promoting effects of Novochizol at the initial stages of organogenesis

Conditions: germination (sweat) chamber. After a 24 hour treatment, seeds were laid on a humid substrate (filters with a cotton layer) in Petri dishes (12 seeds per dish, in quadruplets), natural light, t = +20 ... 22 ° C. Germination energy was measured after 1 and 3 days; and germination capacity after 7 days. Growth indicators at the initial stages of organogenesis were recorded after 3 days (length of roots of each seedling, total length of seedlings) and after 7 days (number of roots per seedling, length of seedlings, total mass of roots and shoot per seedling, and mass of each root).

A positive impact of Novochizol was demonstrated at the lowest concentration (Novochizol 0,05%) as shown in Figure 1:

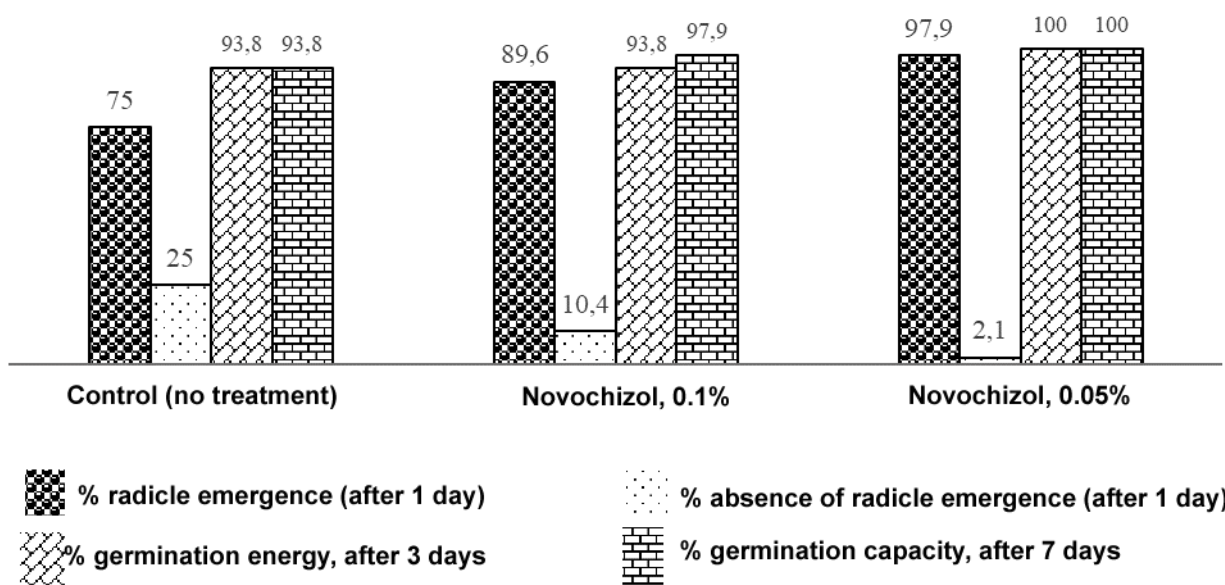


Fig. 1. Effects of Novochizol on germination of Spring Wheat in a germination chamber, natural light, t = +20...22°C, year 2020

Table 1 – Effects of Novochizol on seedling development at the initial stages of organogenesis of Spring Wheat in a germination chamber, natural light, t = +20...22°C, year 2020

Growth duration	Growth indicators	Control	Novochizol 0,1%	Novochizol 0,05%
3 days	Number of roots per seedling	2,9	3,0	3,0
	Root length per seedling, cm	7,79±0,27	8,64±0,46	10,20±0,94
	Length of individual root, cm	2,60±0,12	2,86±0,08	3,4±0,11
	Length of shoot, cm	1,84±0,09	2,29±0,03	2,69±0,30
7 days	Number of roots per seedling	4,41	4,68	4,83
	Length of shoot, cm	10,05±0,75	10,11±0,69	11,27±0,26
	air-dried biomass of roots, per seedling, mg	8,20±0,07	9,60±0,56	9,40±0,20
	air-dried biomass of 1 root, mg	1,86±0,02	2,06±0,15	1,95±0,08
	air-dried biomass of 1 seedling, mg	15,13±0,13	17,25±0,19	16,45±0,41

Higher rates of radicle emergence were observed within one day of Novochizol treatment. The strongest effect was observed with the low concentration suspension (22,9% increase with Novochizol 0,05%; 14,6%; increase with Novochizol 0,1%, with 75% baseline control). The same trend was observed when measuring germination energy (6.2% increase) and germination capacity (control = 93,8%). Treating the seeds with the high concentration Novochizol suspension increased the germination capacity by 4,1%. In the early stages of organogenesis, Novochizol led to an increase in root growth. After 3 days, the total length of roots was 10,9% and 30,9 % higher for the Novochizol 0,1% and Novochizol 0,05% groups, respectively (control = 7,79 cm). At the same time, the most uniform increase was observed in the high concentration Novochizol group (Novochizol 0,1% coefficient of uniformity= 81% (n = 45); Novochizol 0,05% = 78,2% (n = 48); control = 68,9% (n = 45)). The same trend was observed when measuring the height of the seedlings. If the increase after Novochizol 0,05% treatment (46,2% higher than the control =1,84 cm) was more significant than that after Novochizol 0,1 % (24,4% higher than the control), the coefficient of uniformity was higher for the high concentration Novochizol-treated group (Novochizol 0,1 % = 75,4%; Novochizol 0,05% = 72,8% control = 61,7%)

Based on measurements made 7 days after the beginning of the experiment, the low concentration Novochizol treatment enhanced root formation the most (Novochizol 0,05%: increase of 9,5%; Novochizol 0,1%: increase of 6.1%, average number of roots in the control group: 4.41 per seedling). The same were found to be true for the increase in overall seedling length (Novochizol 0,05%: increase of 7,7%; Control: 10,05 cm). In contrast, the highest increase in the biomass were observed following treatment with the more concentrated Novochizol suspension both for the roots (Novochizol 0,1 %: increase of 17.1 %; Novochizol 0,05%: increase of 14.6%) and for the entire seedling (Novochizol 0,1 %: increase of 12.9 %; Novochizol 0,05%: increase of 8.7%)

Experiment 2

Objective: to assess the effects of Novochizol on the growth and development of seedlings of Spring Wheat in soil substrate.

Conditions: Seeds were treated 7 days prior to sowing (alkaline chernozem, 500 gram per plastic pot/ 12 pots, repeated 4 times, natural lighting, $t = 20-22^{\circ}\text{C}$, controlled soil humidity). Germination energy, germination capacity, the height and biomass of seedlings were measured. Growth parameters were recorded during the first 7 days. A higher rate of radicle emergence was observed after 24 hours for seeds treated with Novochizol, especially for the higher concentration (control: 70.8%, relative increase for treated seeds: 27.1% and 23%). 100% germination was obtained after high concentration Novochizol treatment (Table 3)

Table 2 – Effects of Novochizol on seedling development at the initial stages of organogenesis of Spring Wheat in alkaline chernozem soil substrate, natural light, $t = +20...22^{\circ}\text{C}$, year 2020

Indicators			Experimental groups		
			Control	Novochizol 0,1%	Novochizol 0,05%
Germination energy, %	After 1 day	Radicle emergence	70,8	97,9	93,8
	After 2 days	Normally germinated seedlings %	95,9	93,8	100
	After 3 days		97,9	100	83,4
Germination, %		After 7 days	93,8	100	83,4
Length of normally developed shoot, cm		After 2 days	0,71±0,05	1,11±0,05	0,85±0,03
		After 3 days	2,87±0,13	3,40±0,13	2,92±0,06
		After 7 days	18,95±0,30	20,48±0,24	19,31±0,28
air-dried biomass, mg After 7 days		Total seedling	16,65±0,32	18,95±0,41	20,90±0,37
		Roots, per seedling	6,93±0,14	8,53±0,23	9,33±0,22

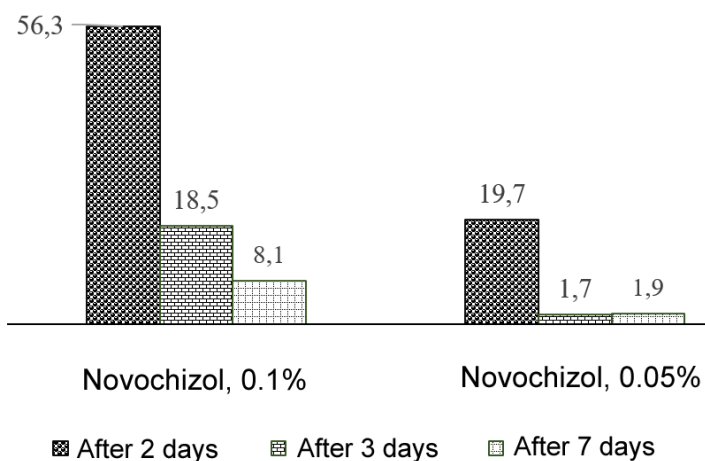


Fig. 2. Growth increase (% increase over control) of aerial parts of Spring Wheat seedlings at the initial stages of organogenesis after Novochizol treatment of seeds.

The high initial rate of stimulation of growth resulting from 0.1% Novochizol treatment (56.3% after 2 days) was reduced 3-fold after 3 days (Novochizol, 0,05%, by 11.6 fold), and after 7 days, by 2.3 fold. The increase in biomass after 7 days compared to the control (16.63 mg) was higher in both the 0.1% Novochizol-treated group (14% higher for total biomass and 23.8% for roots) and the 0.05% Novochizol-treated group (25.7% higher for total biomass and 35.1% for roots). 0.05% Novochizol treatment led to a 1.8-fold increase in total biomass and 1.5-fold increase in root biomass.

In conclusion, the Novochizol treatments resulted in significant growth stimulation in germinating Spring Wheat.