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STUDIES ON THE INFLUENCE OF THE BIOSTIMULATOR UTRISHA AND THE STABILIZER INSTINCT ON ROOT AND SHOOT BIOMASS IN CORN GROWN IN THE CENTRAL AREA OF OLTENIA

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Abstract
The Utrisha biostimulator presents a new approach to the use of nitrogen applied to corn crops. A three-factorial experience with corn hybrids was located for two years (2023 and 2024) on the chernozem of Caracal. Three corn hybrids (factor A) fertilized with 3 doses of urea (factor B) were sown after their seed was treated with the Utrisha biostimulator and the Instinct stabilizer with 4 doses (factor C). The corn hybrids used were: P9944, P0260, P0450.
The tested urea doses were: 50 kg/ha, 100 kg/ha and 150 kg/ha and the biostimulator doses: untreated, Instinct 1 liter/ha + Utrisha N 250 g/ha, Instinct 1.7 liter/ha + Utrisha N 333 g/ha and Instinct 2.5 liter/ha + Utrisha N 400 g/ha. The root biomass and plant height were analyzed in terms of the influence of the studied factors and their interaction. Among the factors, only factor C had a very strong influence on the root biomass and among its graduations, the seed treatment with Instinct 1 liter/ha + Utrisha N 250 g/ha had a very significant influence, this being a lower dose than the recommended one.

Keywords: corn, height, Instinct, root biomass, Utrisha.

1. INTRODUCTION

Agriculture is very sensitive to weather and climate. The effects of climate change on agriculture will depend on the rate and severity of the change. Agricultural biotechnologies play an important role in facilitating adaptation to climate changing conditions, and help farmers to adapt their production to this new challenge (Bonciu, 2019, 2023).

Corn is one of the main crops affected by irregular water regimes. A lack of soil moisture can cause various morphophysiological changes, such as an increase in oxidative activity, a decrease in photosynthetic rates, and a reduction in productivity (Ali et al., 2011; Zaro et al., 2018; Piati et al., 2023).

Manny research findings have helped to clarify the elaborate signaling networks and the sophisticated crosstalk occurring among the different hormone signaling pathways (Miller et al.,

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2008; Kudla et al., 2010; Verma et al., 2016). There are reports of a greater tolerance in crops treated with biostimulants to stress conditions caused by water deficiency, using as an evaluation parameter, the production components and productivity of crops (Albrecht et al., 2009; Piati et al., 2020; Silva et al., 2021; Alsherif et al., 2022). The integration of plant biostimulants use to improve the efficiency of crop production can contribute to increasing the agronomic efficiency (Bonciu et al., 2020; Olaru et al., 2020).

The Utrisha N biostimulator contains a bacterium called *Metylobacterium symbioticum*. The bacterium, immediately after application, enters through the stomata and colonizes the plant, converting atmospheric nitrogen into ammoniacal form used by the plant in biological processes. The bacterium feeds on the methanol emitted by the plant and spreads through the plant with the help of metabolites. According to Corteva's description, the Utrisha N biostimulator is amazing in the way it provides nitrogen whenever the plants need it. This naturally improves the vitality of crops throughout the growing season (URL 1).

The Instinct biostimulator is a nitrogen stabilizer that is used with all types of nitrogen fertilizers. It ensures the efficient use of nitrogen in cereal, rapeseed and corn crops, resulting in higher productivity and lower nitrogen losses. The product has a modern formulation, based on micro-encapsulation, which allows for simple application using herbicide machines, with an activity of up to 12 weeks (depending on soil temperature and humidity) (URL 1).

2. MATERIALS AND METHODS

A three-factorial experiment with corn hybrids was conducted for two years (2023 and 2024) on the chernozem of Caracal. Three corn hybrids (factor A) fertilized with 3 doses of urea (factor B) were sown after their seed was treated with the biostimulator Utrisha and the stabilizer Instinct with 4 graduations (factor C).

The corn hybrids used were: P9944, P0260, P0450.

The urea doses tested were: 50 kg/ha, 100 kg/ha and 150 kg/ha and the biostimulator doses: untreated, Instinct 1 liter/ha + Utrisha N 250 g/ha, Instinct 1.7 liter/ha + Utrisha N 333 g/ha and Instinct 2.5 liter/ha + Utrisha N 400 g/ha.

Root biomass and plant height were analyzed in terms of the influence of the studied factors and their interaction.

Root biomass was determined in 5 plants from the middle rows of each plot (3 factor A graduations x 3 factor B graduations x 4 factor C graduations x 3 repetitions). Height was determined by counting 10 plants from the middle rows, also from each plot.

Climatic conditions were less favorable for corn cultivation in 2024.

3. RESULTS AND DISCUSSIONS

On average over the two years, the corn hybrid influenced the height of the plants, so that the P0260 and P0450 hybrids showed very significant decreases compared to the control hybrid - P9944 (Figure 1). Fertilization with urea did not influence the height, the extremely small differences not being statistically significant (Figure 2). On the other hand, the biostimulator Utrisha N and the stabilizer Instinct strongly influenced the height at all doses but especially at the last two, the increase being very significant (Figure 3).

The results suggest that the biostimulator, under the conditions at Caracal, favors the height increase much more significantly than fertilization with urea, knowing that this is a fertilizer that volatilizes very easily.

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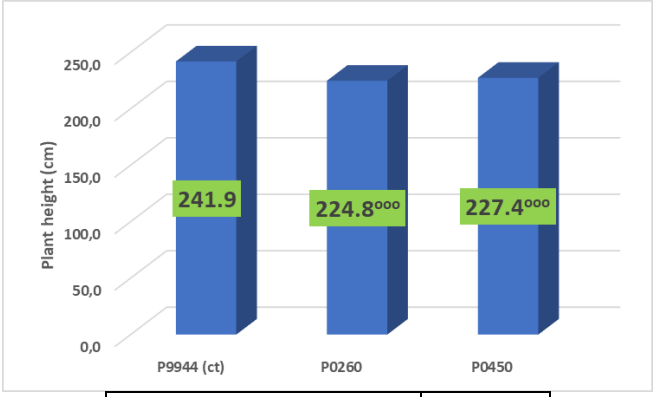
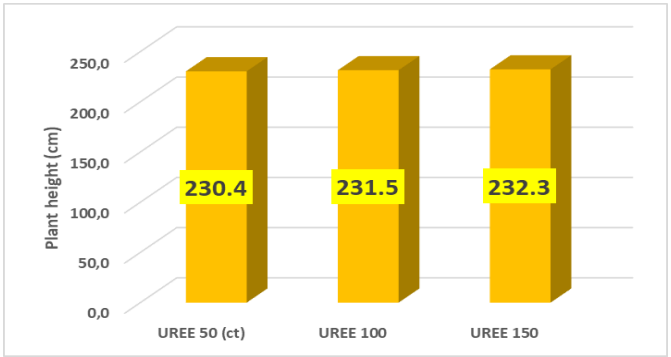
The plant height presented values ranging from 212.7 cm in the P0260 hybrid fertilized with urea at a dose of 100 kg/ha d.a. nitrogen, untreated with biostimulator and 251.5 cm in the P9944 hybrid fertilized with urea at a dose of 150 kg/ha d.a. nitrogen, treated with Instinct 2.5 l/ha + Utrisha N 400 g/ha.
The influence of the interaction hybrid x urea fertilization x treatment with biostimulator Utrisha N + nitrogen stabilizer Instinct was evident but only in the case of 2 of the hybrids: P 0260 and P0450. It acted only in a positive sense, the result being a significant increase in the height at certain combinations of factors highlighted in Table 1.
The results obtained showed that in the hybrids P0260 and P 0450, the treatment with Utrisha and Instinct determined the increase in the height compared to the untreated variety at all levels of urea fertilization but mainly at the first doses of biostimulator and stabilizer: Instinct 1 liter/ha + Utrisha N 250 g/ha and Instinct 1.7 l/ha + Utrisha N 333 g/ha.



DL 5%	8.5 cm
DL 1%	14.1 cm
DL 0.1%	26.5 cm

Figure 1. The influence of the hybrid on plant height in corn – Caracal 2023+2024



DL 5%	3.9 cm
DL 1%	5.5 cm
DL 0.1%	7.7 cm

Figure 2. The influence of urea fertilization on plant height in corn – Caracal 2023+2024

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Table 1. Influence of the interaction hybrid (factor A) x urea fertilization (factor B) x biostimulator Utrisha N + nitrogen stabilizer Instinct (factor C), on plant height in corn – Caracal 2023+2024

FACTOR A	FACTOR B	FACTOR C	Height (cm)	Ct difference	Semnification
a1 – P9944	b1- urea N 50 a.s. kg/ha	c1- untreated (Ct)	246.5	0.0	
		c2- Instinct 1 liter/ha + Utrisha N 250 g/ha	235.4	-11.1	
		c3- Instinct 1.7 l/ha + Utrisha N 333 g/ha	246.2	-0.3	
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	247.0	0.5	
	b2 - urea N 100 a.s. kg/ha	c1- untreated (Ct)	240.3	0.0	
		c2- Instinct 1 l/ha + Utrisha N 250 g/ha	238.0	-2.3	
		c3- Instinct 1.7 l/ha + Utrisha N 333 g/ha	244.2	3.9	
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	239.7	-0.6	
	b3 - urea N 150 a.s. kg/ha	c1- untreated (Ct)	239.3	0.0	
		c2- Instinct 1 l/ha + Utrisha N 250 g/ha	231.7	-7.6	
		c3- Instinct 1.7 l/ha + Utrisha N 333 g/ha	243.7	4.3	
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	251.5	12.2	
a2 – P0260	b1- urea N 50 a.s. kg/ha	c1- untreated (Ct)	216.4	0.0	
		c2- Instinct 1 l/ha + Utrisha N 250 g/ha	228.5	12.1	
		c3- Instinct 1.7 l/ha + Utrisha N 333 g/ha	223.2	6.8	
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	226.5	10.1	
	b2 - urea N 100 a.s. kg/ha	c1- untreated (Ct)	212.7	0.0	
		c2- Instinct 1 l/ha + Utrisha N 250 g/ha	228.9	16.2	*
		c3- Instinct 1.7 l/ha + Utrisha N 333 g/ha	224.9	12.2	
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	230.0	17.3	*
	b3 - urea N 150 a.s. kg/ha	c1- untreated (Ct)	217.0	0.0	
		c2- Instinct 1 l/ha + Utrisha N 250 g/ha	227.9	10.9	
		c3- Instinct 1.7 l/ha + Utrisha N 333 g/ha	233.9	16.9	*
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	228.5	11.5	
a3 – P0450	b1- urea N 50 a.s. kg/ha	c1- untreated (Ct)	214.1	0.0	
		c2- Instinct 1 l/ha + Utrisha N 250 g/ha	229.4	15.3	*
		c3- Instinct 1.7 l/ha + Utrisha N 333 g/ha	229.9	15.8	*
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	221.9	7.8	
	b2 - urea N 100 a.s. kg/ha	c1- untreated (Ct)	221.0	0.0	
		c2- Instinct 1 l/ha + Utrisha N 250 g/ha	234.6	13.6	
		c3- Instinct 1.7 l/ha + Utrisha N 333 g/ha	233.4	12.4	
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	231.2	10.2	
	b3 - urea N 150 a.s. kg/ha	c1- untreated (Ct)	218.0	0.0	
		c2- Instinct 1 l/ha + Utrisha N 250 g/ha	232.0	14.0	*
		c3- Instinct 1.7 l/ha + Utrisha N 333 g/ha	236.0	18.0	*
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	228.0	10.0	
	DL 5%			13.7 cm	
	DL 1%			18.2 cm	
	DL 0.1%			23.6 cm	

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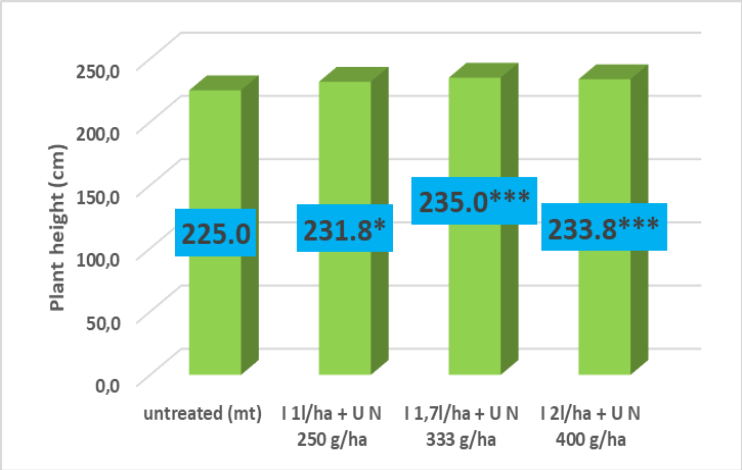
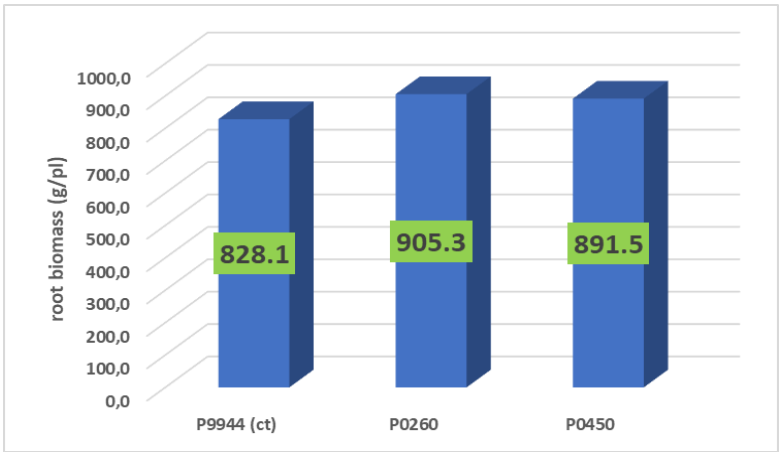


DL 5%	4.5 cm
DL 1%	6.0 cm
DL 0.1%	7.9 cm

Figure 3. Influence of the biostimulator Utrisha N and the nitrogen stabilizer Instinct on plant height in corn – Caracal 2023+2024

Root biomass expressed in grams/plant as the average of root weights from 5 plants on each plot was not influenced by the hybrid (Figure 4) nor by urea fertilization (Figure 5). In contrast, the biostimulator treatment strongly influenced root biomass - very significantly positive at the dose of 250 g/ha Utrisha and 1 l/ha Instinct but distinctly significantly negative at a much higher dose (400 g/ha Utrisha and 2.5 l/ha Instinct) (Figure 6).



DL 5%	120.3 g/plant
DL 1%	199.0 g/plant
DL 0.1%	372.4 g/plant

Figure 4. Influence of hybrid on plant root biomass in corn – Caracal 2023+2024

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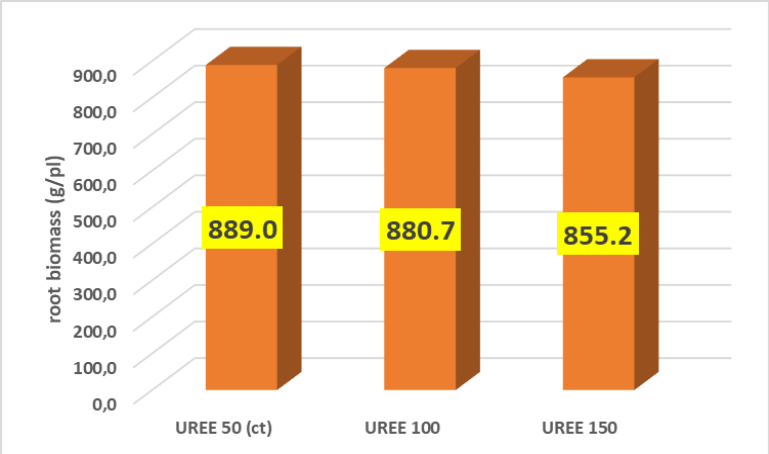
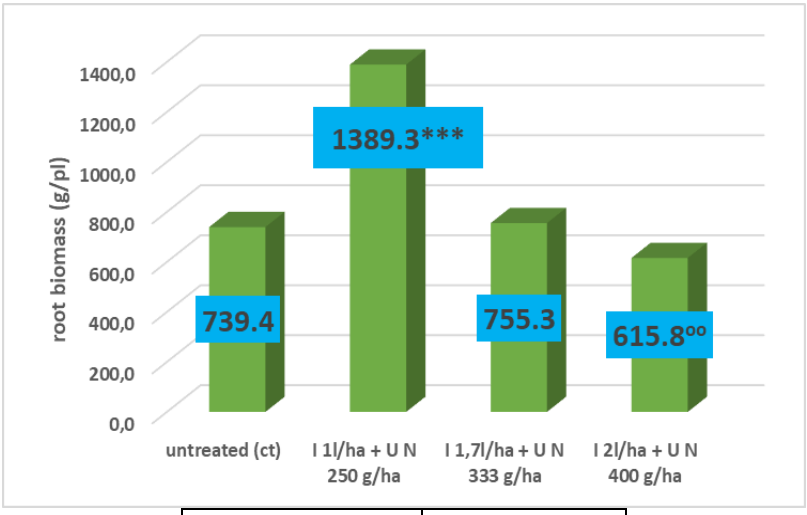


DL 5%	80.7 g/plant
DL 1%	113.3 g/plant
DL 0.1%	160.0 g/plant

Figure 5. The influence of urea fertilization on plant root biomass in corn – Caracal 2023+2024



DL 5%	79.0 g/plant
DL 1%	105.3 g/plant
DL 0.1%	137.1 g/plant

Figure 6. Influence of the biostimulator Utrisha N and the nitrogen stabilizer Instinct on plant root biomass in corn – Caracal 2023+2024

The interaction of the 3 factors also had a particularly strong influence on root biomass. In all hybrids, at all levels of urea fertilization, the treatment with Instinct 1 l/ha and Utrisha 250 g/ha, showed statistically significant increases in root biomass compared to the untreated variant, with one exception (Table 2).

The highest dose - Instinct 2.5 l/ha and Utrisha 400 g/ha caused reductions in root biomass at certain levels of urea fertilization but only in hybrids P9944 and P0450.

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Table 2. Influence of the interaction hybrid (factor A) x urea fertilization (factor B) x biostimulator Utrisha N + nitrogen stabilizer Instinct (factor C), on plant root biomass in corn – Caracal 2023+2024

FACTOR A	FACTOR B	FACTOR C	Root biomass (g/plant)	Ct difference	Semnif.
a1 – P9944	b1- urea N 50 a.s. kg/ha	c1- untreated (Ct)	559.7	0.0	
		c2- Instinct 1 l/ha + Utrisha N 250 g/ha	1531.3	971.6	***
		c3- Instinct 1.7 l/ha + Utrisha N 333 g/ha	891.7	332.0	**
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	568.0	8.3	
	b2 - urea N 100 a.s. kg/ha	c1- untreated (Ct)	742.3	0.0	
		c2- Instinct 1 l/ha + Utrisha N 250 g/ha	1129.3	387.0	**
		c3- Instinct 1.7 l/ha + Utrisha N 333 g/ha	948.7	206.4	
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	452.0	-290.3	oo
	b3 - urea N 150 a.s. kg/ha	c1- untreated (Ct)	541.7	0.0	
		c2- Instinct 1 l/ha + Utrisha N 250 g/ha	1287.2	745.5	***
		c3- Instinct 1.7 l/ha + Utrisha N 333 g/ha	721.7	180.0	
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	563.7	22.0	
a2 – P0260	b1- urea N 50 a.s. kg/ha	c1- untreated (Ct)	704.3	0.0	
		c2- Instinct 1 l/ha + Utrisha N 250 g/ha	969.7	265.4	*
		c3- Instinct 1.7 l/ha + Utrisha N 333 g/ha	768.0	63.7	
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	625.9	-78.4	
	b2 - urea N 100 a.s. kg/ha	c1- untreated (Ct)	437.7	0.0	
		c2- Instinct 1 l/ha + Utrisha N 250 g/ha	2295.0	1857.3	***
		c3- Instinct 1.7 l/ha + Utrisha N 333 g/ha	674.3	236.6	
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	703.3	265.6	*
	b3 - urea N 150 a.s. kg/ha	c1- untreated (Ct)	826.3	0.0	
		c2- Instinct 1 l/ha + Utrisha N 250 g/ha	1392.7	566.4	***
		c3- Instinct 1,7 l/ha + Utrisha N 333 g/ha	762.7	-63.6	
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	703.3	-123.0	
a3 – P0450	b1- urea N 50 a.s. kg/ha	c1- untreated (Ct)	1106.5	0.0	
		c2- Instinct 1 l/ha + Utrisha N 250 g/ha	1443.8	337.3	**
		c3- Instinct 1.7 l/ha + Utrisha N 333 g/ha	839.3	-267.2	o
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	659.7	-446.8	ooo
	b2 - urea N 100 a.s. kg/ha	c1- untreated (Ct)	776.3	0.0	
		c2- Instinct 1 l/ha + Utrisha N 250 g/ha	1286.3	510.0	*
		c3- Instinct 1.7 l/ha + Utrisha N 333 g/ha	568.3	-208.0	
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	554.2	-222.1	
	b3 - urea N 150 a.s. kg/ha	c1- untreated (Ct)	960.0	0.0	
		c2- Instinct 1 l/ha + Utrisha N 250 g/ha	1168.5	208.5	
		c3- Instinct 1.7 l/ha + Utrisha N 333 g/ha	623.0	-337.0	oo
		c4- Instinct 2.5 l/ha + Utrisha N 400 g/ha	712.0	-248.0	o
	DL 5%			236.9 g/plant	
	DL 1%			315.9 g/plant	
	DL 0.1%			411.3 g/plant	

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4. CONCLUSIONS

The treatment with the biostimulator Utrisha and the stabilizer Instinct strongly influenced both the height and the root biomass. The hybrid influenced only the height. None of the studied characters was influenced by the applied urea dose. Instead, the interaction of the three studied factors greatly influenced both the height and the root biomass.

In all hybrids, at all levels of urea fertilization, the treatment with Instinct 1 l/ha and Utrisha 250 g/ha, showed statistically assured increases in root biomass compared to the untreated variant, with one exception. This result allows the use of a lower dose than the recommended one (Instinct 1.7 l/ha and Utrisha 333 g/ha) in an attempt to obtain a much higher root biomass.

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