



Biostimulant Effect of New Seed-Applied Fungicides in Maize Under Different Temperature Regimes

Alberto Di Stefano, Manuel Ferrari, Giuseppe Barion, Cristian Dal Cortivo, Anna Panozzo, Teofilo Vamerli

Dipartimento DAFNAE, Università degli Studi di Padova, Legnaro

Autore corrispondente: alberto.distefano@unipd.it

Introduction and aim

An anticipation of sowing date is a useful strategy to reduce maize drought stress during summer, although this could be limited by initial low temperatures, which impair root growth (Barlow and Adam, 1989). Previously research showed that seed treatment with fungicides, such as the new SDHI Sedaxane, can enhance root growth (Dal Cortivo *et al.*, 2017). **The aim of the present research is to evaluate the biostimulant side-effect of Maxim XL[®] and Maxim Quattro[®], alone or in combination of Vibrance[®], which contain the a.i. Sedaxane, under three different temperature regimes.**

Materials and Methods

- Maize var. SY-Gigantic was cultivated in wall transparent rhizobox at University of Padua, following a completely randomized block design (n=4);
- Temperature treatments: **warm (16°C)**, **cold (10°C)**, **alternate (16°C at the beginning, 10°C after germination)**;
- different seed coating fungicides (developed by Syngenta):

- Untreated controls:** no seed-treatment;
- Maxim XL[®]:** 12.5mL/50K seeds;
- Maxim XL[®] + Vibrance[®]:** Maxim XL[®] + 2.5mL/50K seeds Vibrance[®] (a.i. Sedaxane 50% w/w 500 g L⁻¹);
- Maxim Quattro[®]:** 8.4mL/50K seeds;
- Maxim Quattro[®] + Vibrance[®]:** 8.4mL/50K seeds Maxim Quattro[®]+2.5mL/50K seeds Vibrance[®].



Fig.1: rhizoboxes in climatic chamber

References:

Barlow, P.W., Adam, J.S. 1989. Anatomical disturbances in primary roots of *Zea mays* following periods of cold temperature. *Environ Exp Bot*, 29: 323-336.
Dal Cortivo C., et al. 2017. Biostimulant effects of seed-applied Sedaxane fungicide: morphological and physiological changes in maize seedlings. *Front Plant Sci*, 8: 2072.
Prasad T.K. 1997. Role of catalase in inducing chilling tolerance in pre-emergence maize seedlings. *Plant Physiol*, 114:1369-1376.

Results

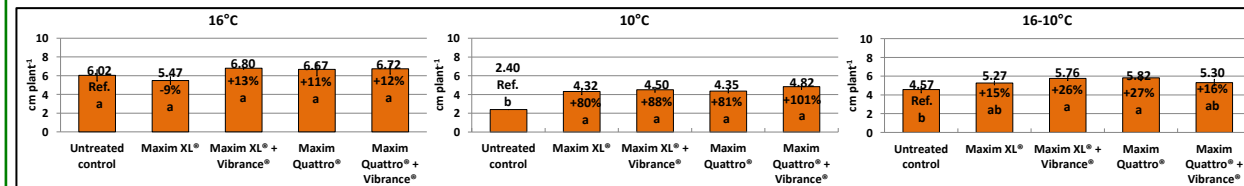


Fig 2. Shoot height of maize seedlings treated with different seed-coating fungicides under different temperature regimes. Above histograms: average of each treatment. Inside histograms: % variation vs. untreated controls.

- all fungicides improved plant height under each temperature regime;
- at 10°C the addition of Vibrance[®] ensure the highest plant height values;
- at alternate temperatures best results were achieved by Maxim XL[®]+Vibrance[®] and by Maxim Quattro[®]

Treatments	Root Length (cm plant ⁻¹)			Root surface area (cm ² plant ⁻¹)			Root tips (n plant ⁻¹)		
	16°C	10°C	16-10°C	16°C	10°C	16-10°C	16°C	10°C	16-10°C
Untreated control	765b	28b	310b	122b	3.6b	60.2b	1069b	25b	639a
Maxim XL [®]	1180ab	146a	572ab	166ab	34.6a	108ab	1874a	196ab	998a
	(+54%)	(+429%)	(+84%)	(+35%)	(+860%)	(+79%)	(+75%)	(+683%)	(+56%)
Maxim XL [®] + Vibrance [®]	1327a	149a	447ab	197a	35.8a	85.8ab	1683ab	227a	886a
	(+74%)	(+437%)	(+44%)	(+61%)	(+895%)	(+43%)	(+57%)	(+806%)	(+39%)
Maxim Quattro [®]	1037ab	134ab	428ab	151ab	33.2a	83.7ab	1650ab	195ab	842a
	(+36%)	(+386%)	(+38%)	(+23%)	(+822%)	(+39%)	(+54%)	(+681%)	(+32%)
Maxim Quattro [®] + Vibrance [®]	1312a	193a	695a	185ab	44.5a	123.7a	1679ab	290a	936a
	(+72%)	(+598%)	(+124%)	(+51%)	(+1136%)	(+105%)	(+57%)	(+1061%)	(+47%)



Fig.3: example of root images

Tab. Main root parameters of maize seedlings treated with different seed-applied fungicides under different temperature regimes. In brackets: % variation vs. untreated controls.

The addition of Vibrance[®] to both Maxim XL[®] and Maxim Quattro[®] strongly increased root growth both at 16°C and under low temperatures, especially at constant 10°C.

Conclusions

- low temperatures impaired plant growth;
- seed-coating fungicides allowed a partial recovery of cold stress. Hypothesis: activation of some physiological response, i.e. biosynthesis of antioxidants (Prasad *et al.*, 1997), and auxin-like activity of the a.i. Sedaxane (Dal Cortivo *et al.*, 2017);
- seed-applied fungicides can sustain plant wellbeing, by protecting seedlings from other biotic and abiotic stresses.