

# THE EFFECT OF AMARANTH GROWING WITH THE USE NON-CHEMICAL PROTECTION METHODS ON THE CATALASE ACTIVITY IN THE SOIL

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The aim of the study was to determine the influence of habitat, cultivar and development growth stage on the catalase activity in soil under two amaranth cultivars – ‘Rawa’ and ‘Aztek’.



Phot. 1. *A. cruentus* L. Rawa cv.



Phot. 2. *A. hypochondriacus* x *A. hybridus* L. Aztek cv.

## MATERIALS AND METHODS

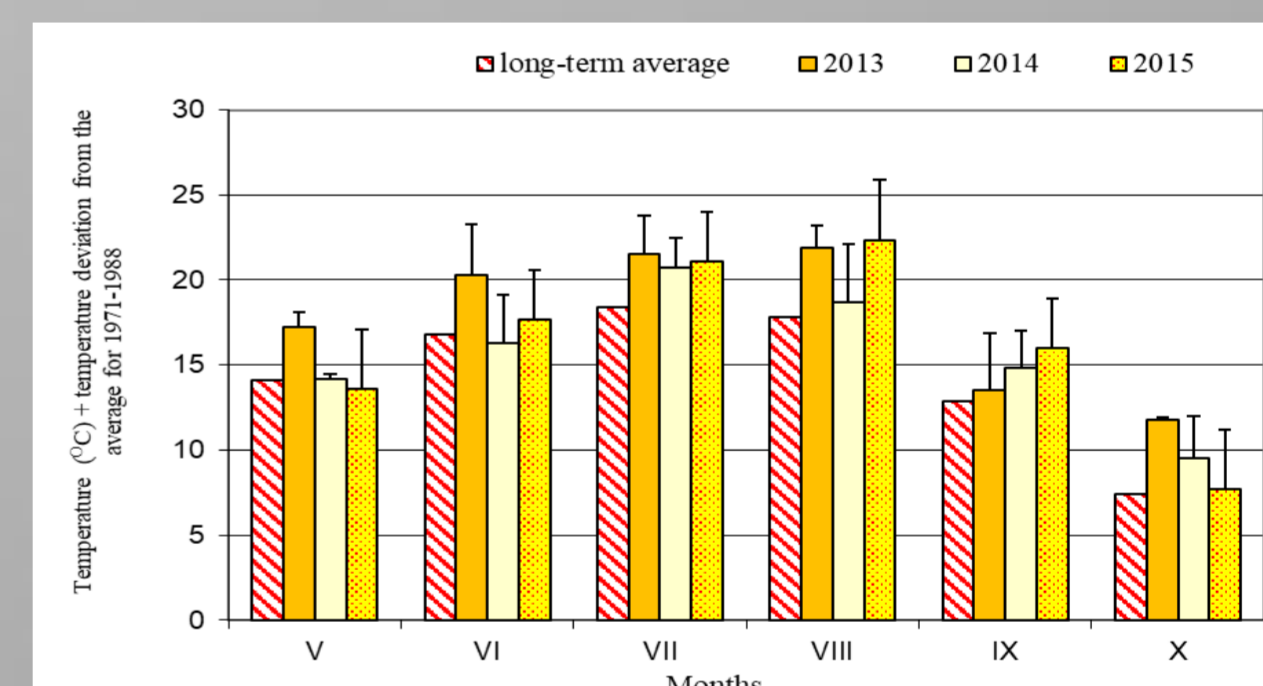
In a 3-year field experiment (2013-2015), amaranth was grown as a test plant in wide-row spacing on the soil of the good wheat complex in the South-Eastern Poland (N-50°71', E-23°04'). The field experiment included 4 variable factors: weathwe conditions; selected growth stages of amaranth (the 5-leaf phase, full flowering and seed maturity); NPK doses combinations (I - 40 kg N·ha<sup>-1</sup>, 30 kg P·ha<sup>-1</sup>, 30 kg K·ha<sup>-1</sup>, II - 60 kg N·ha<sup>-1</sup>, 40 kg P·ha<sup>-1</sup>, 40 kg K·ha<sup>-1</sup>, III - 80 kg N·ha<sup>-1</sup>, 50 kg P·ha<sup>-1</sup>, 50 kg K·ha<sup>-1</sup>, IV - 120 kg N·ha<sup>-1</sup>, 70 kg P·ha<sup>-1</sup>, 70 kg K·ha<sup>-1</sup>) and two cultivars (‘Rawa’ and ‘Aztek’). In the cultivation of amaranth, due to the absence of pathogens and pests, no pesticides were used. Plant protection was limited only to the reduction of weed infestation twice.

## RESULTS

- ❖ The conducted research shows that the main factor differentiate the catalase activity in the soil under amaranth was weather conditions, and then other factors such fertilization, cultivar and growth stage.
- ❖ All analyzed factors had a significant impact on the organic matter in the soil, and only the applied NPK fertilization on the value of sorption capacity.
- ❖ Moreover, it was found that the ‘Aztek’ cv. positively influenced the activity of catalase and the accumulation of humus in the soil than the ‘Rawa’ cv. Beneficial effect of amaranth on the soil environment and its enzymatic activity could be related to the lack of introduced pesticides.

## CONCLUSIONS

1. Factors that differentiated catalase activity in the soil under amaranth cultivation to the greatest extent were: moisture and thermal conditions, followed by the combination of NPK fertilization, cultivar and developmental stage.
2. All analyzed factors had a significant impact on humus content, while only increasing NPK fertilization affected the value of soil sorption capacity under amaranth cultivation.
3. The Aztek cv. had a better effect on catalase activity and favored the accumulation of more humus in the soil compared to the Rawa cv.
4. The obtained results were largely influenced by non-chemical protection of amaranth plantations, similar to organic production. Lack of pesticide application positively affected enzymatic quality of the soil.



Phot. 3. Temperature in the study period

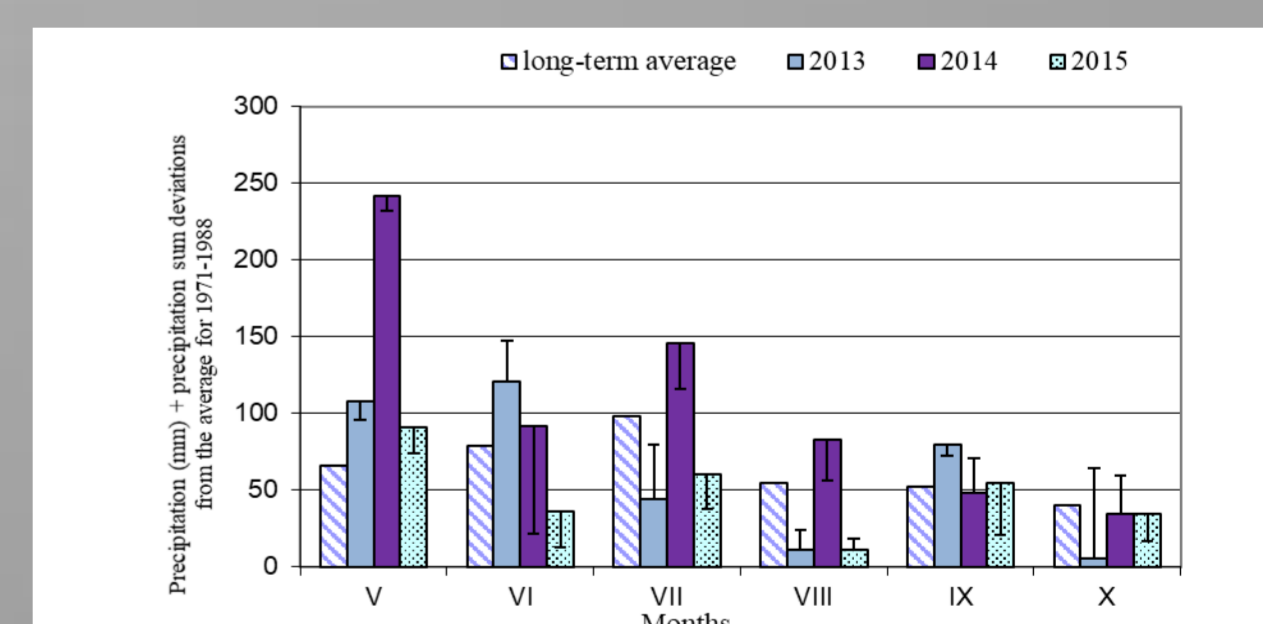


Photo.4. Precipitation in the study period