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# Bioactive Compounds in Hop Cultivars Growing in Poland

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## Introduction:

Hop (*Humulus lupulus L.*) is one of the basic raw materials employed in brewing, but this plant is also interesting for its bioactive compounds which could be used in medicine. Tannins, phenolic compounds, flavan-3-ols, hop bitter acids and xanthohumol showed antioxidant activity. Bitter acids and xanthohumol had also anti-cancer activity.

## Materials and methods

Five of Polish hop cultivars (dry hop cones) from the harvest of 2010 were sampled from some hop-gardens near Lublin in Poland. Two aroma (Sybilla, Lubelski) and three bitter (Magnum, Marynka, Junga) hop cultivars were analysed in this study for content of alpha-acids, tannin, xanthohumol, total polyphenols, flavan-3-ols and proanthocyanidins.

The alpha-acids and tannins were analysed by spectrophotometric methods and the results were expressed as % of dry weight<sup>1</sup>. The xanthohumol content was determined by high-performance liquid chromatography with diode array detection and the results were described as % of dry weight<sup>2</sup>. The total phenolic content was measured using modified Folin-Ciocalteu method and the results were expressed as mg of gallic acid equivalent (GAE) per gram of dry weight<sup>3</sup>. The flavan-3-ols and proanthocyanidins content was analysed with vanilin reagent and the results are expressed as mg of catechin equivalent (CE) per gram of dry weight [3]. Statistical evaluation of the results was done employing the computer program Statistica 8.0 for Windows.



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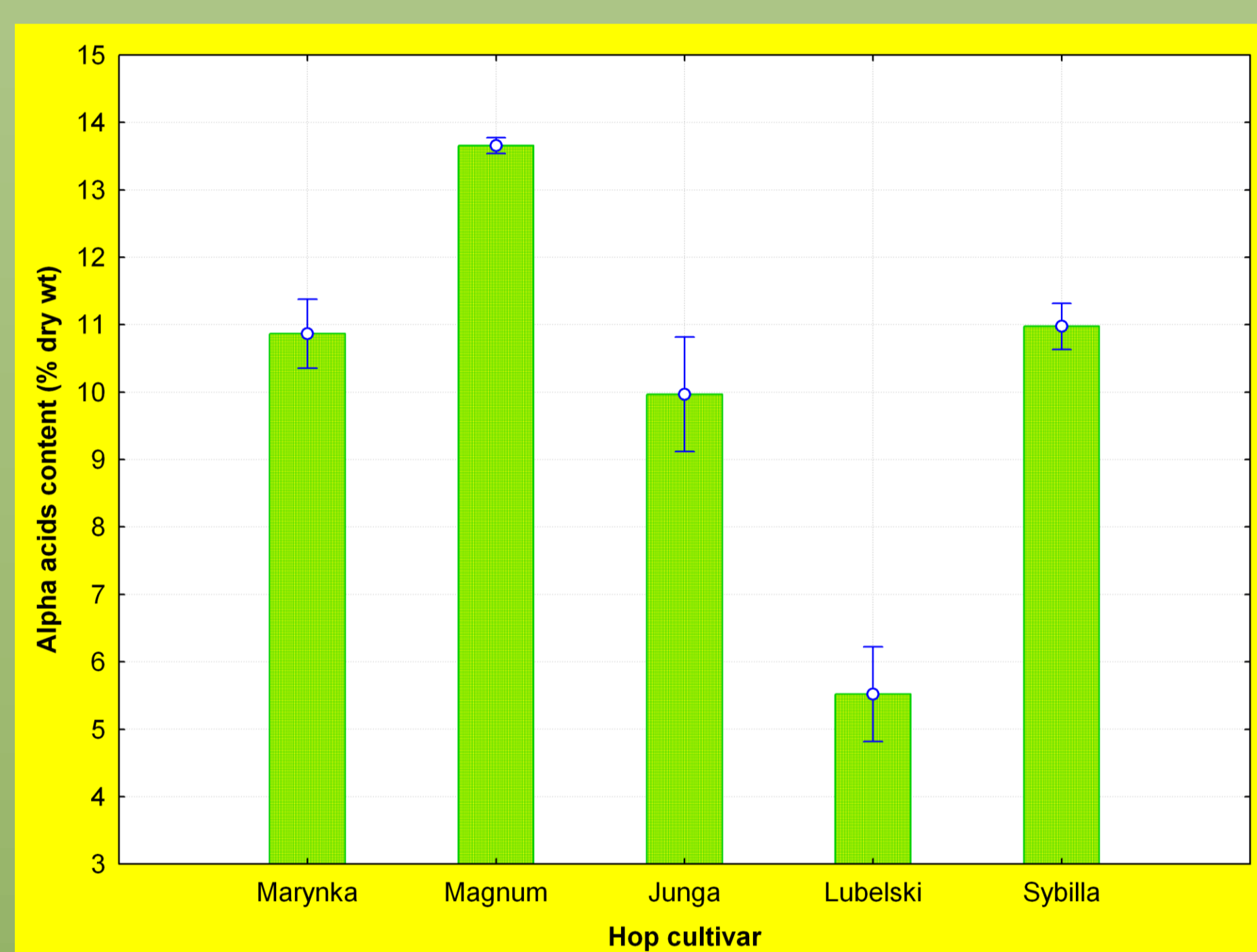


Fig.1. Concentrations of alpha-acids in various hop cultivars.

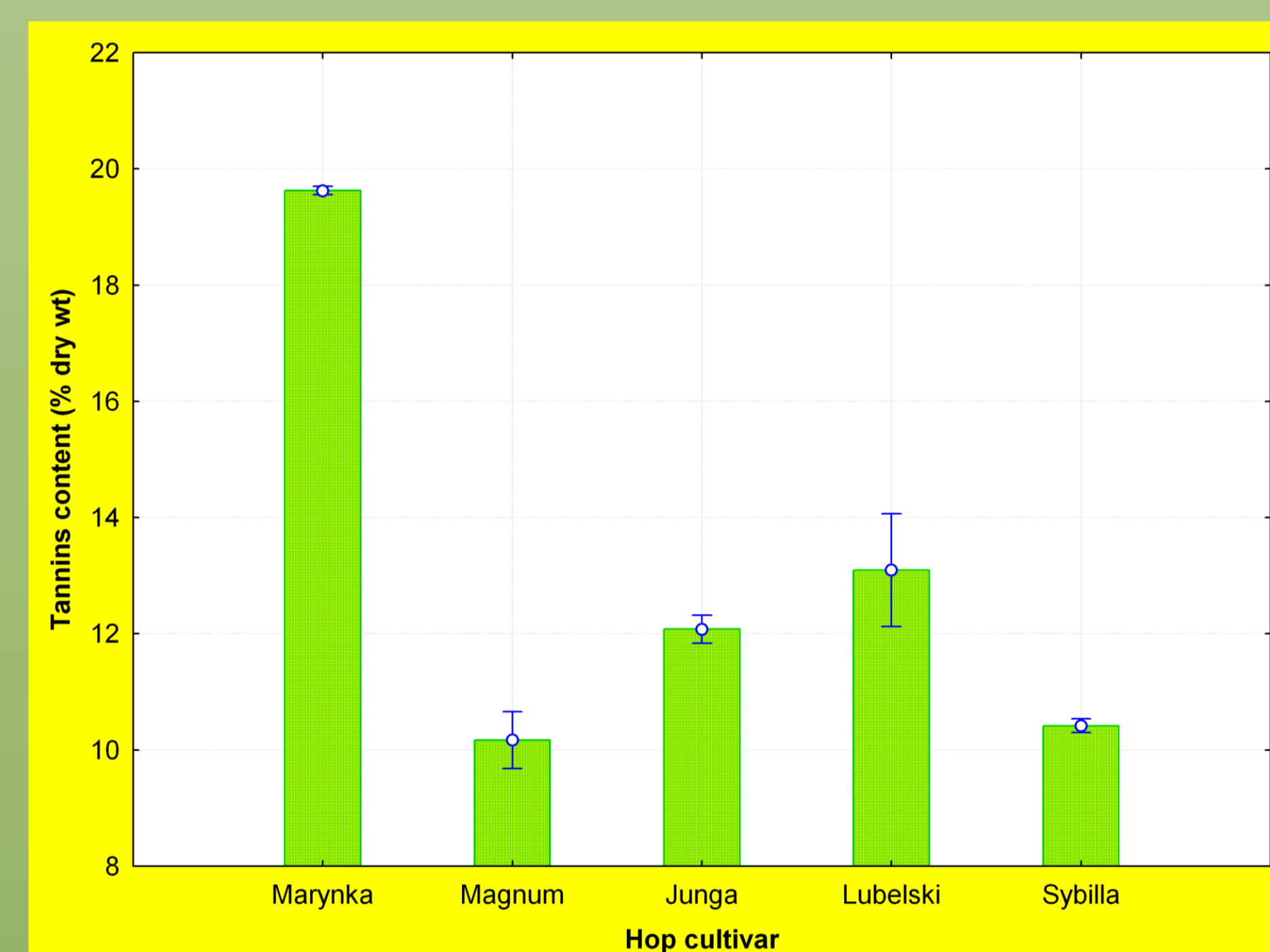


Fig.2. Concentrations of tannins in various hop cultivars.

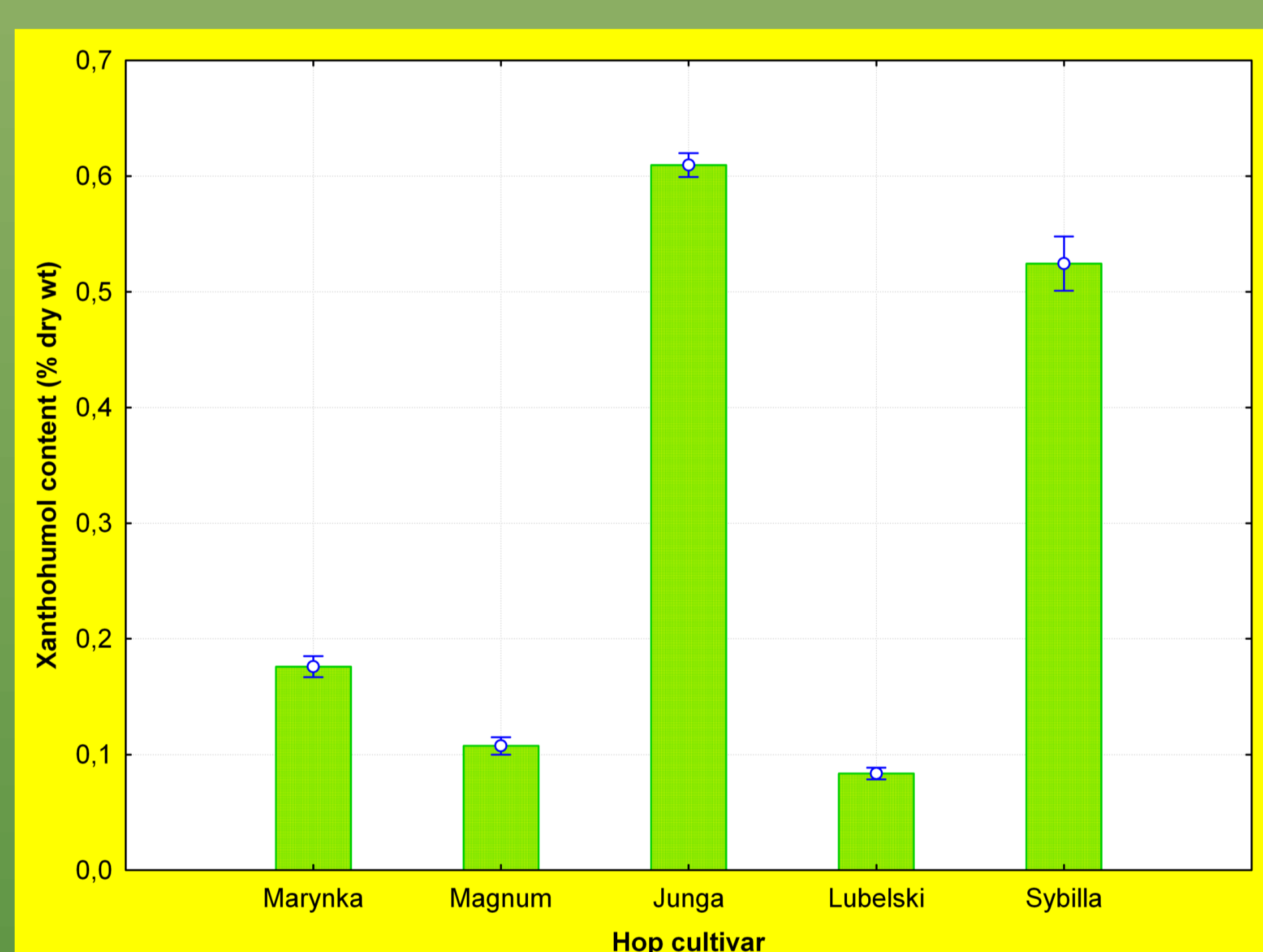


Fig.3. Concentrations of xanthohumol in various hop cultivars.

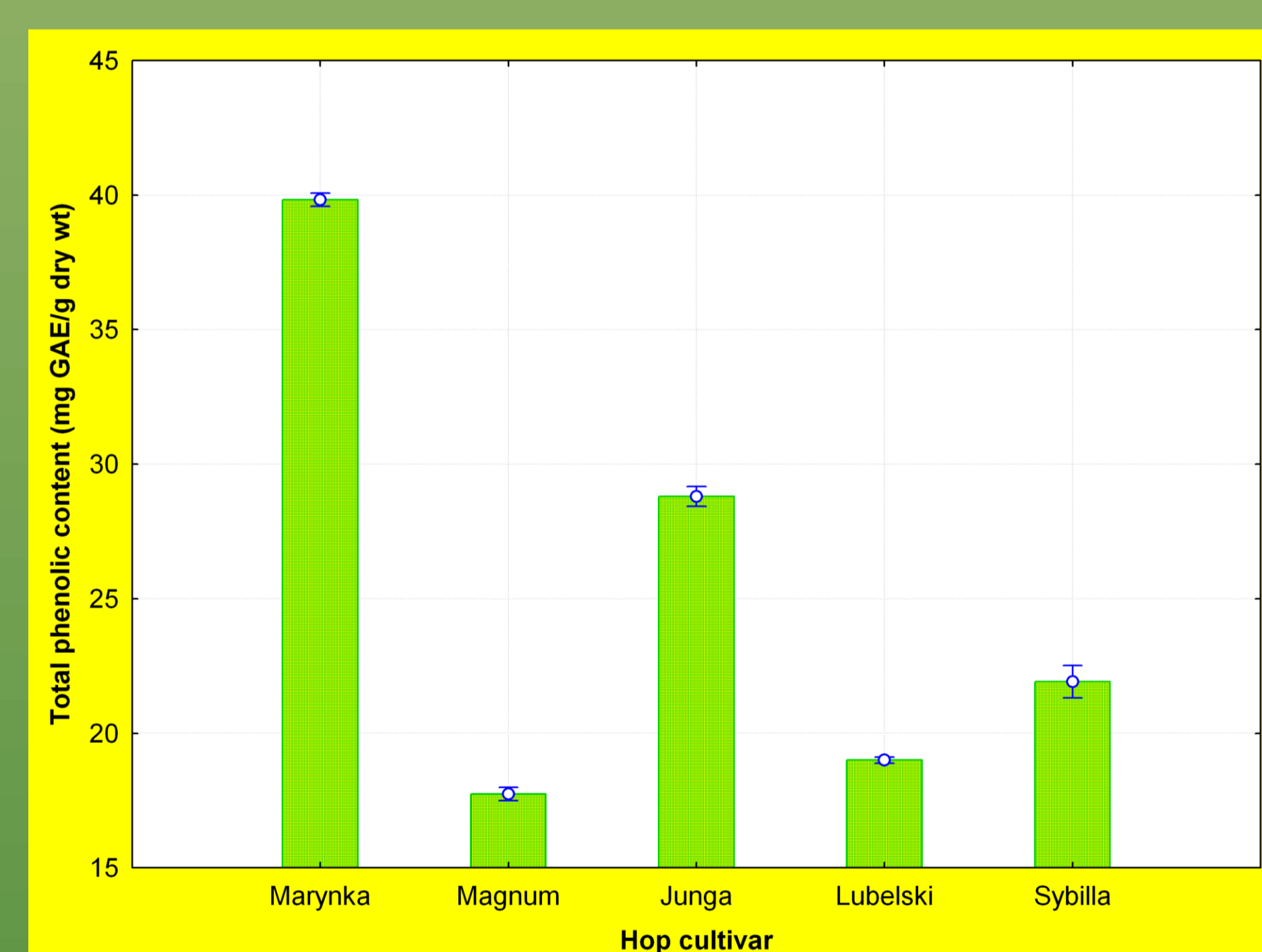


Fig.4. Concentrations of total polyphenols in various hop cultivars.

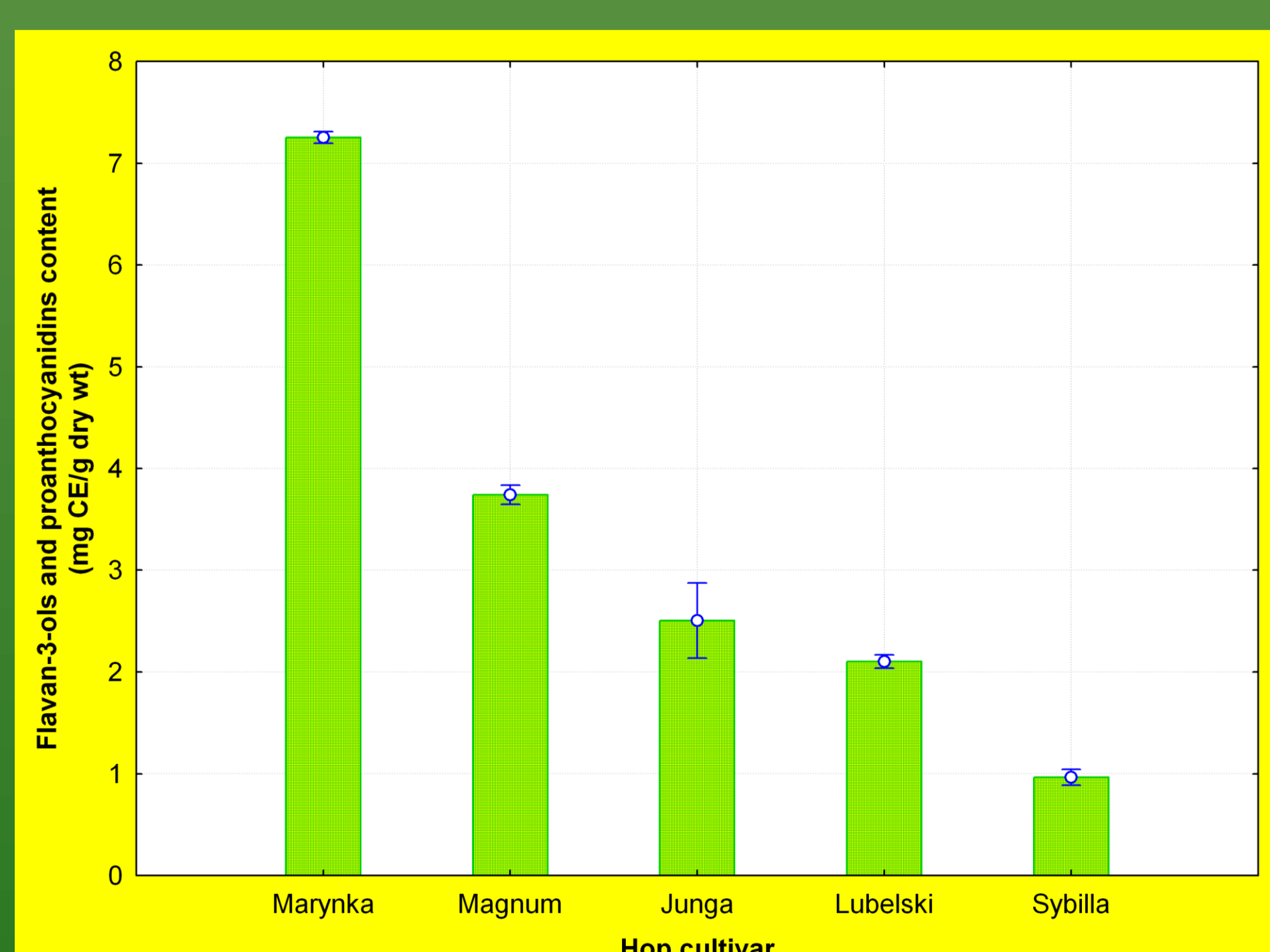


Fig.5. Concentrations of flavan-3-ols and proanthocyanidins in various hop cultivars.

## Conclusions:

1. It was found that cultivar differed in content of bioactive compounds.
2. The highest content of tannin, total phenolic and flavan-3-ols were found in Marynka cultivar and they amounted 19,63 % dry wt, 39,83 mg GAE/g dry wt and 7,25 mg CE/g dry wt, respectively.
3. The concentrations of xanthohumol in hop cultivars amounted in the ranges of 0,08 to 0,52 % (w/w).
4. The highest amount of the xanthohumol was found in Sybilla cultivar, but on the other hand the lowest content of tannin and flavan-3-ols (10,42 % dry wt and 0,96 mg CE/g dry wt, respectively) were found in that cultivar.
5. Magnum cultivar had the highest amount of alpha-acids (13,66 % dry wt).

## References:

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2. Magalhães P.J., Guido L.F., Cruz L.F., Barros A.A., Journal of chromatography A, 1150 (2007), 295-301
3. Magalhães P.J., Vieira J.S., Gonçalves L.M., Pacheco J.G., Guido L.F., Barros A.A., Journal of chromatography A, 1217 (2010), 3258-3268