INSTITUTE OF SOIL SCIENCE AND PLANT CULTIVATION
- STATE RESEARCH INSTITUTE
Czartoryskich 8 st., 24-100 Puławy, Poland

INFLUENCE OF ISOMERISATION ON THE COMPOSITION OF HOP RESINS AND ESSENTIAL OILS

Mieczysław Stasiak

Department of Plant Breding and Biotechnology

INTRODUCTION

Hop crisis in 2007, has caused interest in the brewery products that offer higher efficiency of alpha acids. One way to increase the efficiency of alpha acids is their isomerisation in hop pellets. Alpha acids occuring in the traditional pellets are transformed into an isomerised form during the boiling of wort. Approximately 35% of alpha acids is utilized. Isomerized products allow for a more efficient use of iso-alpha acids in a significantly shorter time.

MATERIALS and METHODS

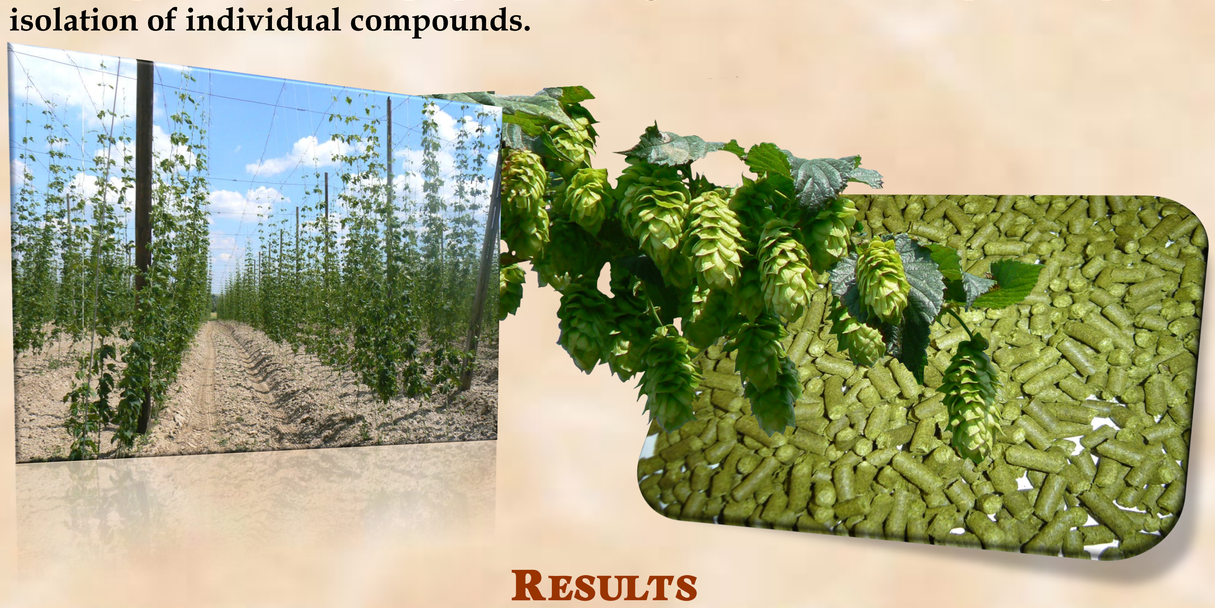
By 2007, the patent protects the method of isomerization of my f-Steiner. In Poland, the method used in the isomerization of hop pellets has been based on own experiences, literature and suggestions of brewing technologists.

Isomerization of alpha-acids in hop pellets leads to the changes in composition of hop resins and essential oils. Studies of hop oils and resins composition before and after isomerisation were performed on Magnum and Marinka cultivar.

Iso- pellets production technology requires a proper preparation of raw hops, and a precise dosage of magnesium oxide powder to the hop, to maintain normal production parameters and to provide pellets control of specific parameters in the iso-chamber.

The concentration of iso-alpha-acids and other ingredients of resins were measured by the HPLC - the ECB 7.8 method, with the current standards, ICS& ICE. Samples were prepared by the ECB 7.5 or 7.7 methods.

The concentration of hop oils as measured by BEI 6.3 or method ASBC-13. It is important to use a proper wavelength detector and to perform precise isolation of individual compounds.



RESULTS

Standard pellets contain a simple alpha-acids, that are comprised of iso-alpha-acids, cohumulene, n+ad humulene and beta-acids: colupulone and n+ad lupulone, fig.1. Isomerisation of pellets is devided into two stages: first – adding of magnesium oxide to the hops powder before granulation, second - heating the pellets. Durind the heating, magnesium hydroxide is formed and above 95 % of components of iso-alpha-acids are chemically bonded, fig. 2. Easily soluble iso-alpha-acids are formed, while beta-acids are not altered.

Course of changes in the alpha-acids in iso-alpha-acids in hops pellets studied variety Magnum and Marynka tab. 1.

Analysing the changes in the composition of hop oils before and after isomerisation, we noticed that the positive essential oils ingredients (eg. humulene, linalool, farnesene, caryophyllene) were sable. Adverse myrcene decreased from about 20%, fig. 3.

The addition of magnesium oxide, resulted in a slight hardening of the iso-pellet and the change in colour from intense green to the dull green compared to the standard pellets.

Technological research confirmed the utilization of the iso-alpha-acids after several minutes of worth boiling, increased the level of bitterness to 30% compared with conventional pellets.

Tab. 1. The content of alpha acids and iso alpha acids before and after isomerisation

	Pellets of Magnum		Pellets of Marynka	
	Before isomerisation	After isomerisation	Before isomerisation	After isomerisation
alpha acids	12,4 %	0,0 %	7,6 %	0,0 %
co humulone	3,4 %	0,0 %	1,5 %	0,0 %
n+ad humulone	9,0 %	0,0 %	6,1 %	0,0 %
iso alpha acids	0,6 %	12,6 %	0,4 %	7,8 %
iso co humulone	0,0 %	3,5 %	0,0 %	1,6 %
iso n humulone	0,6 %	7,8 %	0,4 %	5,7%

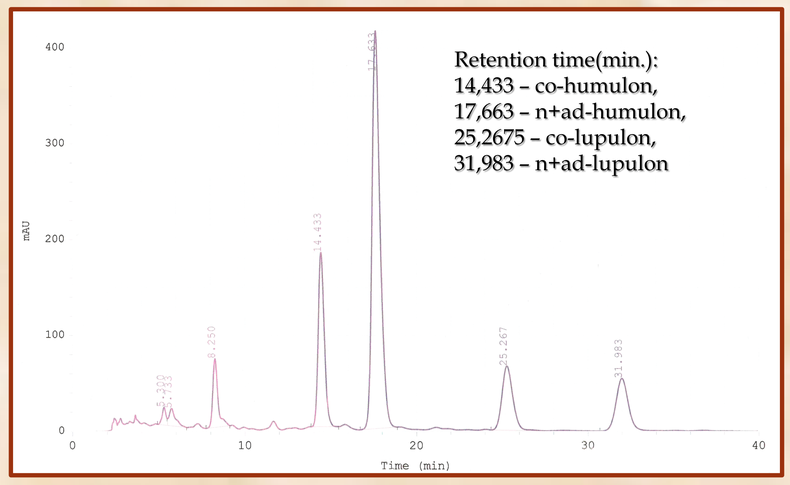


Fig.1. Bitter compounds in the pellets of T-90 before the isomerization.

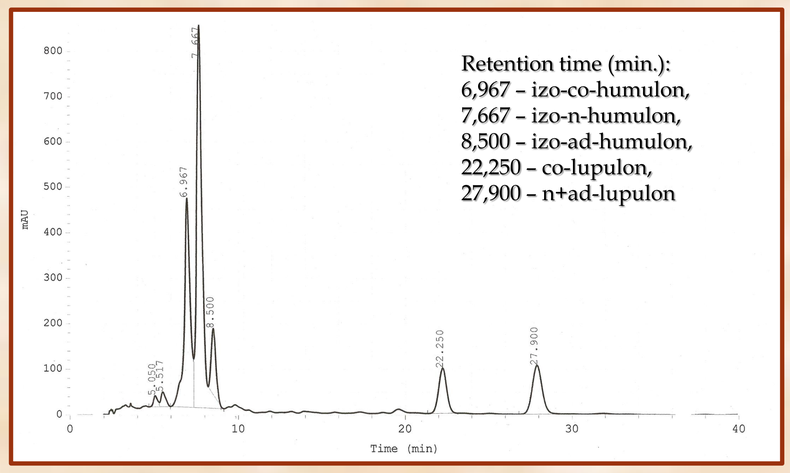


Fig.2. Bitter compounds in the pellets of T-90 after isomerization

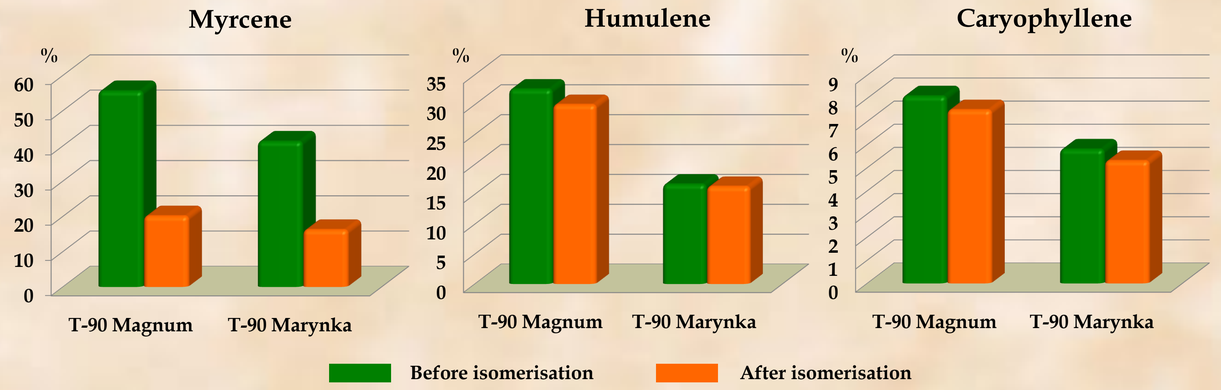


Fig.3. Influence of isomerisation on the content of main constituents of hop essential oils in pellets of Magnum and Marynka cultivars

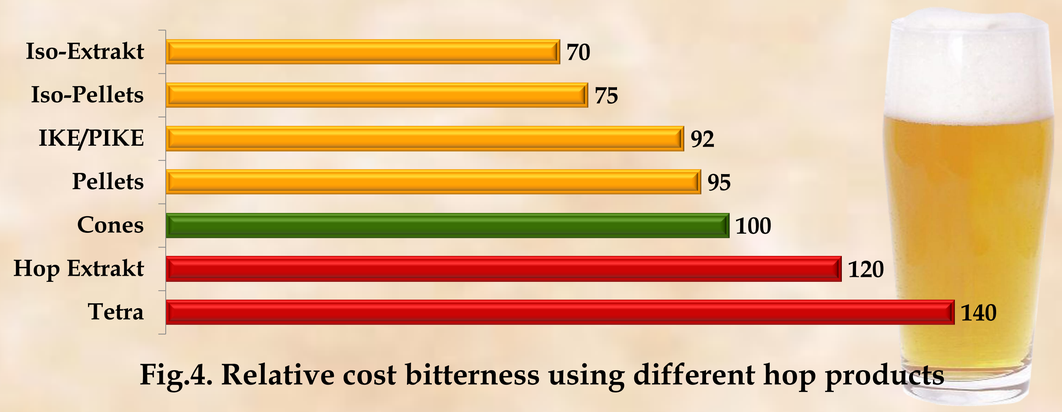


Fig.4. Relative cost bitterness using different hop products

CONCLUSIONS

- Testing the process of isomerization of hop pellets confirm the possibility of obtaining up to 95 % of iso- alpha- acids.
- Iso-pellets allow for an efficient use of alpha acids by more than 30% compared with standard pellets and a considerable utilization of the adverse myrcene for stable maintenance of favorable aromatics.
- Iso-pellets require a shorter time to maximum utilization of iso-alpha acids than boilling wort.
- Technological advantages, plus reduced costs for maintaining the place of iso-pellet as a product of high economic efficiency of the use of bitterness in beer, fig. 4.

Graphic composition: E. Wróblewska