

**SCIENTIFIC COMMISSION OF THE INTERNATIONAL  
HOP GROWERS' CONVENTION**  
**COMMISSION SCIENTIFIQUE DU COMITE INTERNATIONAL  
DE LA CULTURE DU HOUBLON**  
**WISSENSCHAFTLICHE KOMMISSION DES INTERNATIONALEN  
HOPFENBAUBÜROS**

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**Report of the Lecture Part**

**Scientific Commission of the I.H.G.C., George, South Africa**

**20 – 25 February 2005**

**from Elisabeth Seigner**

31 scientists and representatives of the hop and brewing industry from 10 different countries all around the globe joined the meeting of the Scientific Commission in George, South Africa, from 20 - 25 February 2005.

In 12 papers and 10 posters the hop scientists presented their work covering the following topics:

- Hop breeding
- DNA-based methods in hop research
- Hop chemistry
- Hop diseases and pests

**Session I:          Hop Breeding (1)          Chair: G. Brits**

The assessment of resistance to diseases in the UK breeding programme

**P. Darby**

Stability of the productivity of world hop varieties as an important feature for the selection of parental components

**V. Nesvadba and K. Krofta**

Breeding and development of hop varieties at the Hop Research Center Huell

**E. Seigner, A. Lutz, H. Radić-Miehle and S. Seefelder**

Transfer of a resistance gene into hops

**H. Radić-Miehle and E. Seigner**

**Hop Breeding (2)          Chair: A. Čerenak**

Utilisation of chemotaxonomy of male hops for breeding

**K. Krofta and V. Nesvadba**

Genetic sources of hops in the Czech Republic

**V. Nesvadba and K. Krofta**

Cultivation of Czech hop varieties on a farm of Hop Research Institute, Co., Ltd. in Žatec, Czech Republic

**J. Kořen**

Identification of gibberellins and involvement in hop flowering

**N. Fernández Villacorta, M. Á. Revilla and H. Fernández**

**II. Session:      DNA-Based Techniques in Hop Research (1)      Chair: E. Seigner**

Mapping of a powdery mildew resistance gene in hop (*Humulus lupulus* L.)

**S. Seefelder, A. Lutz and E. Seigner**

Hop (*Humulus lupulus* L.) genetic map and QTL analysis

**A. Čerenak, Z. Šatović, and B. Javornik**

Molecular diversity of hops (*Humulus lupulus* L.)

**B. Javornik, J. Jakše, Z. Šatović, N. Štajner, and A. Čerenak**

**DNA-Based Techniques in Hop Research (2)      Chair: B. Javornik**

New molecular markers for hop (*Humulus lupulus* L.)

**J. Patzak, L. Vrba, and J. Matousek**

Characterization of *Verticillium albo-atrum* hop isolates by molecular markers

**S. Radišek, J. Jakše, and B. Javornik**

Callus-derived hop plants show correlation between epigenetic instability and time in culture

**E.L. Peredo, M.A. Revilla, J.M. Martínez-Zapater and R. Arroyo-García**

**III. Session:      Hop Chemistry                              Chair: M. Kac**

Contents of prenylflavonoids in Czech hops and beers

**K. Krofta, V. Nesvadba, J. Poustka, K. Nováková and J. Hajšlová**

Production of Xanthohumol enriched hop extracts using carbon dioxide as solvent at pressures up to 1000 bars

**R. Schmidt, J. Schulmeyr and M. Gehrig**

**IV. Session:      Hop Diseases and Pests (1)      Chair: S. Seefelder**

Development and testing of a forecasting model for powdery mildew (*Podosphaera macularis*) in hops in Bavaria

**B. Engelhard**

The resistance phenomenon in damson-hop aphid (*Phorodon humuli* Schrank) in the Czech Republic

**J. Vostřel**

Economic threshold of intervention against *Phorodon humuli* (Schrank, 1801) (*Hemiptera: Aphididae*) in Leon (Spain): Hop parameters prior to calculation

**A. Lorenzana, A. H. de Mendoza, J.A. Magadán, and M.V. Seco**

**Hop Diseases and Pests (2)                              Chair: P. Matthews**

Occurrence of Phytoplasma on hops in Poland

**E. Solarska**

Infection of HLVd in hop gardens in the Czech Republic

**P. Svoboda, J. Matousek, J. Patzak, and K. Krofta**

Second thoughts about different ways of evaluation of spraying techniques

**M. Kac**

## **V. Hop Excursions: Gerrie Brits**

- An introduction to the South African Hop Industry and SAB Hop Farm Facilities
- two half day tours to the SAB hop Farm Rob Roy and SAB Hop Facilities

## **Summary**

### **Session I: Hop breeding**

High yield, excellent brewing quality and an increased level of resistance to diseases and pests are the stated aims of all hop breeding programs. Following these aims, it is crucial to improve the selection efficiency. In this context the appropriate methods for the assessment of resistance towards the major fungal diseases were presented. To a greater extent the chemical analysis of bitter acids and essential oils of male hops should be exploited to facilitate the evaluation of male crossing partners. Studies were presented which confirmed that high-yielding, high alpha varieties can only be created through the selection of specific parents. Classical cross breeding supported by molecular marker techniques were presented in developing new varieties adapted to the needs of growers and brewers as well. A new perspective in breeding may be genetic engineering. The first transgenic hops expressing a chitinase gene were presented showing increased resistance towards powdery mildew. Other key elements of breeding like the preserving, broadening and characterization of the genetic resources were presented as well.

### **Session II: DNA-based techniques in hop research**

In genome analysis various applications of DNA-based markers have been presented. Microsatellites were used to estimate the genetic variability of the hop germplasm, which is crucial to all breeding programs. Genetic maps saturated with AFLPs (amplified fragment length polymorphism) and microsatellites were created: in one work QTL markers associated with alpha acid content could be identified, in another study closely linked AFLP markers for powdery mildew resistance were detected and mapped. Molecular markers were also used to study and elucidate the structure of functional genes involved in metabolic and resistance processes. Comprehensive molecular characterization of *Verticillium* strains revealed differences between mild and lethal isolates. These investigations are of great importance in tracing the spread of a very aggressive form of *Verticillium* wilt in Slovenia. For effective disease management certainly this information is needed. Since HLVD (hop latent viroid) infected plants do not show any symptoms, pathogen diagnosis is only possible using PCR-based techniques. In the case of phytoplasma infections, hops showed morphological changes, but PCR gave the direct proof of this pathogen. It is quite obvious that PCR-based techniques are exploited to establish marker assisted selection and that they are valuable tools for the precise diagnosis of pathogens.

### **Session III: Hop chemistry**

There is currently much interest in prenylflavonoids and among them especially in Xanthohumol. Since this compound has shown a significant anticarcinogenic potential, hop chemists focus on the analysis of the amount of Xanthohumol and its derivatives in hop varieties and beers. Although specific varieties provide 1% and more of this compound, during the brewing process a high percentage of Xanthohumol is converted into its iso-form. But the production and usage of a xanthohumol enriched hop extract would significantly increase the amounts of this anticarcinogenic substance in beer.

## **Session VI: Hop diseases and pests**

Powdery mildew (PM) caused by *Podosphaera macularis* (formerly called *Sphaerotheca humuli*) is a serious disease which is associated with significant loss of quality and yield. Thus, the development of a forecasting model for PM will help growers to apply fungicides more efficiently. Besides fungal diseases, infestations with Damson hop aphids are a problem, especially in hot seasons. Investigations clearly showed that the registration of new efficient aphicides is urgently needed, since aphid populations in the Czech Republic have already evolved resistance to several insecticides. Moreover, for an efficient control of aphids a threshold for economic damage should be established. In another paper factors that influence the application of pesticides were elucidated. In this way valuable information was given about what should be kept in mind when spraying and evaluating the efficacy of pesticides or phytopharmaceutical substances in practice.

## **Session V : An introduction to the South African Hop Industry and SAB Hop Farm Facilities**

Special interest was aroused by the presentation of Gerrie Brits, our host for this meeting of the Scientific Commission. He gave an overview about the South African Hop Industry and the SAB Hop Farms. During two half day excursions to the SAB hop yards, current hop varieties and breeding lines could be assessed by the hop experts. In the SAB breeding program main emphasize is put on the development of high-yielding high alpha varieties adapted to the South African growing conditions. During these tours Gerrie Brits also showed the whole procedure from the harvest of the hop cones at the SAB Hop Farms and their contract growers to the processing of the hop cones at the SAB facilities. A guided tour through the SAB brewery in Cape Town completed our educational program.

## **Award for Gerrie Brits in acknowledgement for his commitment to this meeting of the Scientific Commission (SC)**

A highlight of the meeting was the presentation of a collection of German hop seals to Gerrie Brits. Bernhard Engelhard as the chairman and Dr. Elisabeth Seigner as the secretary of the Scientific Commission handed out this award to Gerrie Brits in acknowledgement of his commitment to this meeting of the SC. This collection of hop seals, assembled by the German Association of Hop Growers, has been given only to five selected persons before.

## **Résumé**

Also this time, the meeting of the SC has proven to be a valuable forum for bringing together hop experts with different backgrounds and responsibilities. In their papers and posters hop scientists presented their current research and together with their partners from the hop and brewing industry they discussed issues facing the hop growers and the hop market in order to develop common strategies for the future.

I think we are all agreed that it has been a most successful event.

Dr. Elisabeth Seigner  
Secretary, Scientific Commission, IHGC

March 2005