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NORDIC BILBERRY PROJECT
ZIEMEĻVALSTU MELLEŅU PROJEKTS

Laura Jaakola[1], Mika Paassilta[1,5], Marko Suokas[1], Inger Martinussen[2], Kristiina Antonius[3], Andreas Åkerström[4], Asdis Helga Bjarnadottir[5], Úlfur Óskarsson[5], Anja Hohtola[1], Anna Maria Pirttilä[1], Simo Moisio[6], Olavi Junttila[7], Ulla Bång[4] and Hely Häggman[1]

[1]Department of Biology, University of Oulu, POB 3000, FIN-90014 Oulu, Finland,
[2]Bioforsk, P.O.B.6232, N-9292 Tromso, Norway,
[3]Nordic Gene Bank (NordGen), P.O.B. 41, SE-23053 Alnarp, Sweden,
[4]SLU, Department of Agricultural Research for Northern Sweden, P.O.B. 4097, SE-90403 Umeå, Sweden,
[5] Agricultural University of Iceland, Hvanneyri, 311 Borgarnes, Iceland,
[6]Arctic Flavours Association, Kauppakatu 20, FI-89600 Suomussalmi, Finland,
[7]University of Tromsø, Department of Biology, Dramsveien 201, N-9037 Tromsø , Norway,
e-mail: laura.jaakola@oulu.fi

Abstract

Wild berries are a characteristic part of Northern nature and a particular speciality of Nordic countries. Wild berries are also a rich and valuable resource that has not yet been exploited in a satisfactory level. Approximately 90 – 95 % of the whole wild berry crop yield is left unpicked in the Nordic forests every year. The challenges of wild berry utilization are similar in Nordic countries - the logistics of berry picking including traceability, fragmented sector structure as well as the high share of unprocessed raw material in export. The Nordic project focusing on bilberry (*Vaccinium myrtillus*) "Bilberry: Towards functional food markets" (2007 – 2009) is a part of the New Nordic Food programme funded by the Nordic Innovation Centre. The programme aims to enhance cooperation and innovation among companies that utilize the natural resources of the Nordic countries. The aim of the project is to improve wild berry production and utilization in the Nordic and global market. To achieve this goal a network between the Nordic experts presenting the different fields of the wild berry sector has been established. The project has focused on marketing research, quality issues, biodiversity and the traceability of wild berries; especially the bilberry. The results of the marketing survey were published in November 2008. The aim of the survey was to generate an overall picture of the companies working with wild berries in Nordic countries and to gather information on the existence and willingness of the berry companies to cooperate in wild berry supply, logistics, marketing and research and development. According to the results, a general agreement for the need of increased cooperation at the Nordic level was highlighted.

Kopsavilkums
Savvaļas ogas ir Skandināvijas dabas raksturīga sastāvdaļa un īpaša Ziemeļvalstu dabas vērtība. Savvaļas ogas ir arī bagāts un vērtīgs resurss, kas vēl nav izmantots apmierinošā līmenī. Aptuveni 90 – 95 % no visas savvaļas ogu ražas Ziemeļvalstu mežos katru gadu paliek nenovāktas. Savvaļas ogu izmantošanas problēmas Skandināvijas valstīs ir līdzīgas - ogu savākšanas loģistika, ietverot izpŗti, sadrumstaloto sektora struktūru, kā arī lielu daļu neapstrādātās izejvielas eksportā. Ziemeļvalstu projekts koncentrējas uz mellenēm (*Vaccinium myrtillus*) „Mellenes: ceļā uz funkcionālās pārtikas tirgu" (2007 – 2009) un ir daļa no jaunās Ziemeļvalstu pārtikas programmas, ko finansē Ziemeļvalstu inovācijas centrs.
Programmas mērķis ir veicināt sadarbību un inovāciju starp uzņēmumiem, kuri izmanto dabas resursus Ziemeļvalstīs, kā arī uzlabot savvaļas ogu ražošanu un izmantošanu Ziemeļvalstīs un Pasaules tirgū. Lai sasniegtu šo mērķi, jākooperējas starp Ziemeļvalstu ekspertiem, kas nodarbojas ar dažādiem pētījumu virzieniem par savvaļas ogām. Projekts ir vērsts uz tirgus pētījumiem, kvalitātes jautājumiem, bioloģisko daudzveidību un savvaļas ogu, it sevišķi, melleņu izpēti.
Mārketinga aptaujas rezultāti tika publicēti 2008. gada novembrī. Aptaujas mērķis bija iegūt vispārēju priekšstatu par kompānijām, kas strādā ar savvaļas ogām Ziemeļvalstīs un apkopot informāciju par uzņēmumu gatavību sadarboties savvaļas ogu piegādē, loģistikā, tirdzniecībā, pētniecībā un attīstībā. Balstoties uz iegūtajiem rezultātiem, tika panākta vispārēja vienošanās par stiprākas kooperācijas nepieciešamību Ziemeļvalstu līmenī.

Key words: bilberry, quality, marketing survey, new nordic food

Introduction
Bilberry (*Vaccinium myrtillus* L.) belongs to the most important wild berries in northern Europe and is recognized for its bioactive properties (Lau *et al.* 2005, Canter & Ernst 2004). Wild berries are a valuable part of European nature and tradition. In the northern and eastern parts of Europe wild berries grow abundantly and in these areas the picking of wild berries and mushrooms is an important recreation for people. About half of the wild berries are picked for personal consumption and the remainder are used for commercial utilization. In these areas wild berries are a speciality, which could be utilised and marketed notably better. The average bilberry yield in Scandinavia has been estimated to be over 500 million kg per year, from which only 5 – 8 % is used (Salo 1995).
Wild berries are an excellent source for functional food that should demand a higher valuation and product development in Europe. Nowadays, the biggest part of wild berries picked commercially in North Europe is exported as frozen unprocessed raw material to East Asia or the Central-European food industry. China and Japan are the biggest buyers of European wild berries, a market of which is increasingly focused on health products. The wild berry industry in Europe is typically fairly small and fragmented. One problem is that the annual wild berry crop yields vary markedly in different areas and the yield estimates of the crop have been inaccurate with the present methods. In addition, to better utilise the valuable raw material more knowledge on the uniform quality of wild berries growing in different areas is needed. By characterising the attributes of the growth areas of the best wild berry crops, would provide a sustainable and natural ways to improve the future prospects of wild berry production in a changing climate. Moreover, sustainable methods for improving the logistics of wild berry picking would be needed. A Nordic project focusing on the bilberry (*Vaccinium myrtillus*) "Bilberry: Towards functional food markets" was initiated in 2007. The project is a part of the New Nordic Food programme funded by the Nordic Innovation Centre. The programme aims to enhance cooperation and innovation among companies that utilize the natural resources of the Nordic countries. The aim of the project is to improve wild berry production and utilization in the Nordic and global market. Three work packages including networking, marketing research and quality aspects have been the basis of the project to achieve the stated goal. The general scheme of the project is presented in figure 1.

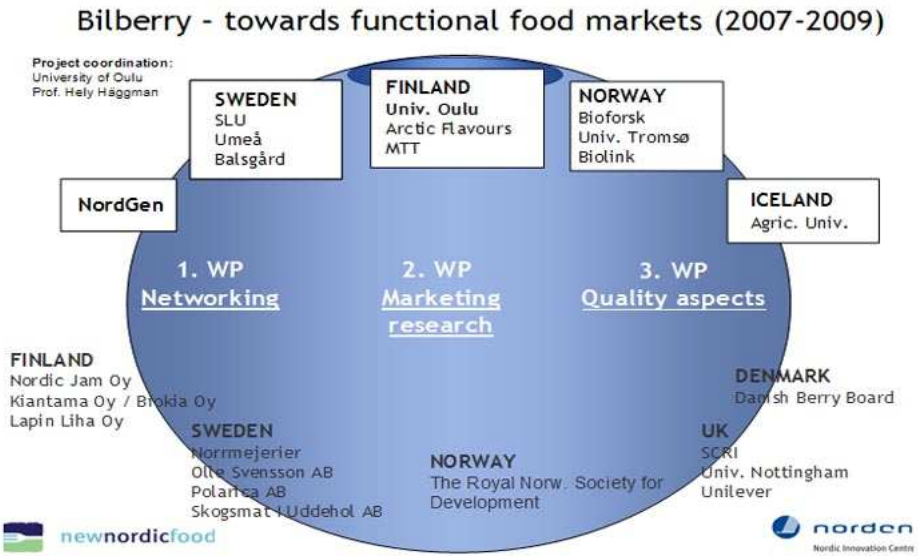

Figure 1. A general scheme of the Nordic bilberry project.

Networking. The bilberry project is co-ordinated by the University of Oulu, Finland, and the other participants are the Arctic Flavours Association and MTT Agrifood Research Jokioinen from Finland, the Nordic Gene Bank (NordGen), the Swedish University of Agricultural Sciences (SLU), Bioforsk, the University of Tromsø and Biolink from Norway and the Agricultural University of Iceland. There are also some companies and other institutions as network partners of the project. During the project, information gathered on companies dealing with wild berries in Nordic countries was listed.

The bilberry project organized the Nordic wild berry seminar at the University of Oulu, Finland on 6^{th}-7^{th} November 2008. In the seminar, there were altogether 50 participants from Finland, Sweden, Norway, UK, Canada and Japan. The participants were representatives of research institutes, wild berry companies and other related organizations. The two-day program consisted of presentations on health and quality issues, marketing and the product development of Nordic wild berries. A panel discussion with the title: "Wild berry production in the northern areas – Guidelines for the future" was held at the end of the seminar. In the discussions, increased co-operation between all interested parties in the wild berry sector was emphasised. The general consensus was that in the future, there would be a need for a joint organisation (e.g. Nordic Wild Berry Association) to maintain the established networking and productive discussions via the general meetings and mailing lists.

Marketing survey. The aim of the marketing survey was first of all to generate an overall picture of the rather heterogeneous and large group of Nordic companies working with wild berries – especially bilberries. Another aim was to gather information on how the companies feel about certain issues related to the wild berry sector, e.g. if companies have problems in gaining enough wild berries. A special emphasis was given to cooperative actions between the companies. The aim was to find out whether, and to what extent, the companies are willing to cooperate in order to reach some of their common goals and what are the areas of business that they consider worthwhile to cooperate in. The common goals include wild berry supply, logistics, marketing and research and development. The survey was carried out in 2007 – 2008. First task was to gather information from the Nordic companies dealing with wild berries. The eight page questionnaire was delivered to 1300 companies, 200 of which were Finnish, 750 Swedish and 350 Norwegian. The results were analysed, compiled and first published in the Nordic Wild Berry Seminar at Oulu, Finland in November 2008 and afterwards also as a printed report (Paassilta et. al., 2009). The results of the survey shown that Nordic wild berry companies are for increased co-operation in Nordic level concerning several common issues. For instance, creating a uniform traceability system for all Nordic countries in wild berry picking was supported. Most of companies also supported the development of common Nordic wild berry brand in the future.

Quality research. The most important issue for berries as a raw material for the functional food market is the quality characteristics of the fruit. Fruit quality is a consequence of proper fruit development, which is a complicated biochemical process and, to a great extent, genetically regulated. However, also environmental factors such as light conditions and temperature affect the ripening process, and the yearly fluctuations can influence the content of secondary metabolites in ripening fruits (Åkerstöm *et al.* 2009). In terms of bilberry production, more knowledge on the factors affecting the ripening process and quality of the fruit is needed. In the Nordic Bilberry project, quality research is going on in several areas. The effect of the growth conditions (day length and temperature) has been studied in a controlled experiment in a phytotrone using clonal material (Martinussen *et al.* unpublished). Additionally, bilberry samples from various altitudes have been collected as well as berry samples from trials in controlled environments. Also bilberries from different latitudes that have been growing in the same growth conditions for several years have been analysed (Åkerstrom *et al.* unpublished). Moreover, molecular level study on the regulation of bilberry fruit development has revealed new information on transcription factors that are necessary for fruit ripening and also about the accumulation of anthocyanins - the important pigments and antioxidants (Jaakola *et al.* unpublished).

In the project, bilberry clones have been collected from all Nordic countries. The samples are presently in the tissue culture, and they will be planted in the test field of the University of Oulu for further extend the clone collection for future research purposes. One task of the project was to optimise a method for bilberry diversity analysis. The retrotransposon based method has shown that genetic diversity exists between and among the bilberry populations from different regions and origins (Antonius *et al.* unpublished).

At present, a poor knowledge of the genome of the bilberry or other *Vaccinium* species is the limiting factor for many applications. A better knowledge of the bilberry genome could be utilised in determining the origins of small fruits for marketing purposes. Increasing berry imports and exports have demonstrated the need for new methods to confirm the origin of the raw material. Moreover, one major problem in the global wild berry markets is that the final products may also contain other berry or plant species than what is mentioned on the product label. In the Nordic bilberry project a bilberry fruit specific EST-library is under construction, with 454-sequencing technology (Roche Diagnostics). Moreover, a new DNA level method for authenticity analyses of wild berry species has been developed (Jaakola *et al.* unpublished).

Conclusions

The Nordic bilberry project has reached most of the results that were set at the beginning of the project. The project has shown that with co-operation and concerned and active participants it is easier to achieve the desired goals. The marketing survey among the companies dealing with wild berries gives a fresh overview on the prospects of the Nordic wild berry business. The scientific efforts in the project are shedding light on the gene x environment interaction related to the quality issues of the bilberry. These results are to some extent applicable to other wild berries also. Moreover, the networking and discussions between the interested participants of the whole wild berry sector have emphasised the need for increased international co-operation and created new ideas for future activities. However, the long term challenges in the wild berry sector still need additional brainstorming, research work, product development, customer surveys and action.

Acknowledgements

'The Bilberry – towards functional food markets' project is funded by Nordic Innovations Centre.

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DOMINANT PHYTOPHAGES OF EDIBLE HONEYSUCKLE (*LONICERA EDULIS* Turcz. ex Freyn) IN BELARUS AND THE EFFICIENCY OF BIOLOGICAL PREPARATIONS APPLICATION AGAINST THEM
DOMINĒJOŠIE ĒDAMĀ SAUSSERŽA (*LONICERA EDULIS* Turc. Ex Freyn) KAITĒKĻI BALTKRIEVIJĀ UN BIOPREPARĀTU EFEKTIVITĀTE TO KONTROLEI

Natallia Kaltun, Svetlana Yartchakovskaya, Ryta Mikhnevich
Institute of Plant Protection, p. Priluki, 223011 Mira Str.2., Minsk region, Belarus
e-mail: belizr@tut.by

Abstract
The objective of our research was the study of the specific and structural diversity of phytophages in honeysuckle plantations and the generalization of optimization system of their phytosanitary condition. The phonological observations on the development of the host plant and phytophages were carried out in 2005 – 2008 in plantations of the Institute of fruit growing Minsk region. The pest records were kept every 10 days, starting with «buds breaking» on not less than 10 bushes of every variety. The experiments on the evaluation of the efficiency the biological preparations against the main honeysuckle phytophages were accomplished in 4 times repetition (3 bushes per repetition). The biological preparations against the dominant pest species were applied during the most vulnerable development periods for the noxious organisms.
It has been determined that the main pests both by occurrence and number in the honey suckle plantations of Belarus are honeysuckle – cereal aphid - *Rhopalomyzus lonicerae* Siebold, rose leafroller - *Archips rosana* L., bud codling moth - *Spilonota ocellana* Den. et Schiff. Sporodic damage is caused by spider mite - *Tetranychus urticae* Koch. and the European fruit lecanium - *Parthenolecanium corni corni* Bouch. Among three being studied (‘Goluboe vereteno’, ‘Vasilievskaya’ and ‘Lakomka’) the variety ‘Lakomka’ is less damaged by pest infestation. Also this variety was not damaged by the specialized honeysuckle pest – honeysuckle - cereal aphid.
It has been determined that the biological preparation baciturine, ps, titre 45 – 60 mlrd spores g^{-1} manufactured based on *Bacillus thuringiensis, var. darmstadiensis*, strain № 24 – 91 at the Institute of Microbiology National Academy of Sciences of Belarus and the Institute of plant protection at the rate of application 6 l ha^{-1} decreases the rose leafroller caterpillars number by about 42 – 55 %. The efficiency of the experimental batch of the biological preparation lecanicil application also produced in Belarus based on the fungus *Lecanicillium (Verticillium) lecanii* (Zimm.) Zare et W. strain BL-1 6 l ha^{-1} against honeysuckle-cereal aphid eventes a decrease of 22 – l42 %.

Kopsavilkums
Šo pētījumu mērķis bija izpētīt ēdamā sausserža kaitēkļu daudzveidību plantācijās un apkopot datus par to fitosanitārās situācijas optimizācijas iespējām. Saimniekauga un kaitēkļu fenoloģiskie novērojumi tika veikti no 2005. līdz 2008. gadam Augļkopības Institūta plantācijās Minskas apgabalā. Kaitēkļi tika uzskaitīti ik pēc 10 dienām, sākot no pumpuru plaukšanas fāzes ne mazāk kā 10 krūmiem no šķirnes. Biopreparātu efektivitātes pētījumi pret nozīmīgākajiem ēdamā sausserža kaitēkļiem tika veikti četros atkārtojumos pa 3 krūmiem katrā atkārtojumā. Biopreparāti tika pielietoti kaitīgā organisma visjutīgākajā attīstības fāzē.
Skaita un izplatības ziņā nozīmīgākie ēdamā sausserža kaitēkļi Baltkrievijā bija graudaugu laputs - *Rhopalomyzus lonicerae* Siebold, rožu lapu tinējs - *Archips rosana* L. un pumpuru kode - *Spilonota ocellana* Den. et Schiff. Atsevišķos gadījumos postīga bija arī tīklērce *Tetranychus urticae* Koch. un *Parthenolecanium corni corni* Bouch. Starp trīs pētītajām šķirnēm (‘Goluboe vereteno’, ‘Vasilievskaya’ un ‘Lakomka’), vismazāk kaitēkļu bojājumu bija šķirnei ‘Lakomka’. Šo šķirni nebojāja arī specifisks sausseržu kaitēklis – sausseržu-graudaugu laputs.