

## NORBARAG (NORDIC BALTIC RESISTANCE ACTION GROUP) – A NEW RESISTANCE ACTION GROUP COVERING DENMARK, ESTONIA, FINLAND, LATVIA, LITHUANIA, NORWAY AND SWEDEN

Per Kudsk, Department of Integrated Pest Management at Aarhus University in Denmark and the first chairman of NORBARAG outlines the objectives and activities of the resistance action group



Per Kudsk

Although pesticide resistance is less widespread in the Nordic and Baltic countries than in other parts of Europe several new cases of resistance have shown up in recent years. This development and the expectation that what is now known as Regulation 1107/2009 would lead to a reduced number of available modes of action were the reasons a meeting was held in Denmark in December 2007 to discuss the establishment of a Nordic resistance action group. Participants included researchers, consultants,

pesticide efficacy evaluators and representatives from the agrochemical industry. The idea was supported by all participants, but due to the fact that the future EU Zone A – North also includes the Baltic countries as well as the Nordic countries and because the Nordic-Baltic area by most agrochemical companies is considered one region from a product development and marketing point of view it was decided to invite the Baltic countries to join the group. They accepted the invitation and in November 2008 the first NORBARAG meeting was held in Finland. The second meeting was held in Lithuania in December 2009 and the third meeting will be organized in Norway in November this year.

### Objectives of NORBARAG

The objectives of NORBARAG are to:

- provide a forum for information exchange between people actively involved in research into pesticide resistance and efficacy evaluation of pesticides
- ensure that cases of resistance in the Nordic-Baltic region are verified and listed
- discuss strategies to avoid resistance and to manage resistant populations
- define research needs, discuss test methodologies and agree on standards
- promote collaboration on resistance screening and other research topics related to pesticide resistance
- promote awareness on pesticide resistance issues e.g. by producing educational material
- maintain contacts with similar groups in other countries

NORBARAG is independent but maintains contacts with the agrochemical industry founded resistance committees (FRAC, IRAC and the European branch of HRAC). Formally NORBARAG is listed as a working group within the Nordic Association of Agricultural Scientists (NJF). NORBARAG meets once a year for one day with half a day dedicated to sub-group meetings and half a day allocated for the NORBARAG meeting.

The Chairman of NORBARAG is elected for a 2-year term. The office of Chairman will rotate between the 6 countries and can only be filled by a representative of the official research institutes. The first chairman of NORBARAG was the author of this paper and he was replaced January 1 this year by Henrik Hallqvist (Henrik.Hallqvist@jordbruksverket.se) from the Swedish Agricultural Board who will function as chairman until the end of 2011.

### Sub-groups

NORBARAG has 3 subgroups, one on herbicide resistance, one on fungicide resistance and one on insecticide resistance. The subgroups deal with issues related to the specific groups of pesticides such as test methodologies and strategies, while NORBARAG deals with more general issues.

The following is a short description of these activities. Further information can be provided by the chairmen of the sub-groups.

#### Herbicide resistance sub-group.

Chairman: Jan Netland (Jan.Netland@bioforsk.no)

Resistance to ALS inhibitors has been reported for *Stellaria media*, *Papaver rhoeas* and *Galeopsis tetrahit* in Denmark, *Stellaria media*, *Galeopsis tetrahit*, *Sonchus asper*, *Spergula arvensis* and *Tripleurospermum inodorum* in Norway and *Stellaria media* in Sweden and Finland. Furthermore, resistance to ACCase inhibitors has been found in *Alopecurus myosuroides* in Denmark and Sweden. It is expected that particularly resistance to ALS inhibitors will become more widespread in the coming years due to reliance on these groups of chemistry in several of the countries.

It is recognized that alignment of evaluation methods is crucial for detecting herbicide resistance hence it was decided to conduct a ring test with resistant *Alopecurus myosuroides* biotypes including the Petri dish test developed at Rothamsted and a standard pot test. This test will be carried out in the near future.

Wild oat (*Avena fatua*) is an important weed species in the Nordic-Baltic region and every year cases of unsatisfactory control are reported. Increased tolerance has been postulated to be the cause of this. To find out whether this is the case seeds of wild oat were collected in all countries. The seeds were grown in pots and sprayed with 3 wild oat herbicides at the Dept. of Integrated Pest Management in Denmark. Significant differences between the biotypes were observed to one of the herbicides suggesting that herbicide susceptibility may have changed over the years. The results will be discussed at the forthcoming NORBARAG meeting and published afterwards.

**Fungicide resistance group. Chairman: Lise Nistrup Jørgensen (LiseN.Jorgensen@agrsci.dk)**

The fungicide sub-group have two main activities. One is to maintain an updated list of confirmed cases of fungicide resistance in the NORBARAG region. The situation is very different in the 7 countries, e.g. with more widespread resistance to the group of Quinone outside inhibitors (QoI) in Denmark and Sweden than in the other countries. So far no cases of resistance to this group of fungicides have been reported in Norway and Estonia. The differences between the countries reflect the different use pattern within the region.

The major activity of the sub-group is collaboration on monitoring activities. In 2009 monitoring was done for *Septoria tritici*, *Drechslera teres*, *Drechslera tritici-repentis*, *Rhynchosporium secalis*, *Ramularia collo-cygni*, *Microdochium nivale* and *Phytophthora infestans*. These activities have been continued in 2010 where powdery mildew and *Alternaria* have been added to the list. The monitoring activities are typically done in collaboration between public research institutions and the agrochemical companies.

**Insecticide resistance group. Chairman: Nina Johansen (Nina.Johansen@bioforsk.no)**

The main activity of the insecticide resistance group has been monitoring for resistance in pollen beetle (*Meligethes aeneus*). Surveys were conducted in Denmark, Sweden, Lithuania and Finland. In Denmark, widespread resistance is observed against lambda-cyhalothrin while tau-fluvalinate and thiacloprid are still effective. In contrast, in Sweden widespread resistance to both lambda-cyhalothrin and tau-fluvalinate was found. In Lithuania resistance to lambda-cyhalothrin is on the rise, but not as common as in Denmark and Sweden. This pattern reflects that pollen beetle resistance was first observed in Sweden, then in Denmark and most recently in Lithuania.

The insecticide sub-group, like the fungicide sub-group, also maintains an updated list of confirmed cases of insecticide resistance. Due to the very restricted number of modes of actions available to farmers in the NORBARAG region there is also an intention to establish an alert list of pest species believed to be specifically prone to develop resistance.

### Other activities

Due to the interest of two of the sub-groups to maintain lists of confirmed cases of resistance it was decided at the latest meeting to build an Access-based database containing all confirmed cases of resistances.

Another issue that has been discussed in all sub-groups is harmonisation of the resistance management recommendations on the label. Comparisons of labels have revealed pronounced differences in the recommendations that cannot be explained by differences in cropping conditions and/or availability of other modes of action. It is the intention to come up with proposals for standard sentences that can be adopted by the local authorities. This is believed to be very helpful when Regulation 1107/2009 is put in force and zonal registration becomes a reality.

### Final remark

The launching of NORBARAG has been very successful in terms of both participation at the meetings (>50 participants), the background of the participants (researchers, consultants, regulators and the agrochemical industry) and the level of activity in the sub-groups proving the need for a resistance action group, and we look forward to ongoing co-operation between all interested parties in order to help manage pesticide resistance in our region in the future.

Per Kudsk is leading the Pesticide and Environmental Chemistry Research Group at the Dept. of Integrated Pest Management, Aarhus University in Denmark. His own research work focuses on optimising herbicide performance and integrated weed management including resistance management. He has been involved in several international projects on weed management and crop protection. In recent years he has also been involved in research on herbicide effects on non-target plants, invasive weed species and allelopathy. He is used as expert advisor on issues relating to pesticide use by Danish ministries and authorities. He served as President of the European Weed Research Society from 2008 to 2009 and is chairing the Programme Committee for the 6<sup>th</sup> International Weed Science Congress to be held in China in 2012.

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