Report on conference

European Association for Potato Research (EAPR) Pathology and Pest Section Meeting

1st to 5th September 2019, Neuchâtel, Switzerland

Theme: Reducing pesticide use while preserving potato productivity and profitability

Focused on Potato blackleg and bacterial wilt

Yeshitila Degefu- Natural Resources Institute Finland (Luke)

Plant Health Group

Summary

The meeting brought together about 70 scientists from 19 different countries and six continents. A total of 27 lectures and 8 posters were presented in six different lines of investigations of potato diseases namely, epidemiology and management, vector borne diseases, Oomycetes (potato late blight in particular), tuber blemishes and blackleg and bacterial wilts. Advances recorded so far current challenges and future opportunities were discussed during the talks and poster presentations. In addition, the conference program created opportunities for interactions among participants and possibilities for networking. Taken together the meeting was a success and from my point of view I have benefited from participating in the meeting. This being said on general level, I will provide some more details regarding the theme "Blackleg and bacterial wilts" which is the subject of my expertise. The sub headings (framework of the report) reflect more or less the entire content of the presentations and discussions of the meeting particularly in the blackleg and bacterial wilt session. The material was prepared in way easily understandable to the grass root and experts alike with a take home message about current status and future prospect of blackleg and soft rot on potato.

1. Blackleg and soft rot of potato- disease of global importance

The studies presented from Africa, Europe, Latin America and North America indicated that blackleg of potato caused by *Dickeya* and *Pectobacterium* species has become an important disease of potato causing significant global economic losses in potato production. Among the interesting phenomenon noted is the diversity and distribution of the bacterial species. The southward northward expansion of the species hitherto confined to warm tropical and/or cool temperate climates has increased the complexity of the disease problem. A case in point is the introduction and establishment of *Dickeya solani* as an important cause of blackleg in Finland, one of the most north agricultural regions of the world as it became evident from the presentation (Degefu) based on a decade and half monitoring and surveillance of *Dickeya* and

Pectobacterium in Finland. To date *D. solani, P. atrosepticum, P. parmenteiri, P. carotovorum and P. brasiliense are* reported to cause damages in Europe, Africa and Latin America. Reports from the United States indicate that *D. dianthicola* is emerging to be serious problem. The species is less problematic in Europe*. P. brasiliense* is currently the most widespread cause of blackleg in the Netherlands, Switzerland, Israel and South Africa. The incidence of the *P. brasiliense* is increasing in Finland in recent years. Whereas, the incidence of *D. solani,* one of the most aggressive species until recently, is declining in several countries including Finland. The decline of *D. solani* in Finland resulted following the act of zero tolerance practiced by Finnish seed companies and farmers. *P. atrosepticum* is reported from South Africa for the first time and reported as a newly emerging species in the country.

The economic losses on potato production due to *Dickeya* and *Pectobacterium* are not well known because there is not detailed study and data so far. A result of 13 years study from Switzerland indicated that the average annual loss due to *Dickeya* and *Pectobacterium* was 270 CHF/ha for seed potato production and about 140 CHF/ ha for ware potato production. Direct losses in yield and losses due to downgrading and rejections of seed lots were considered in the economic analysis.

2. Ecology of Blackleg and soft rot bacteria- Survival and overwintering

Three presentations including mine gave highlights on the ecology of *Dickeya* and *Pectobacterium* particularly on the survival ability of the bacteria outside the host plant (potato). The findings so far suggest that *Dickeya* and *Pectobacterium* do not survive long outside the potato plant and latently infected seed is still believed to be the main source of inoculum for infection and seasonal carry over of the bacteria.

Our findings in Finland indicate that the bacteria survive only few weeks in soil and do not survive the Finnish cold winters in tubers, especially those, brought to the surface during ploughing. However, the bacteria have been detected from volunteer potato plants resulting from tubers which were buried deep in soil.

2.1. Survival in weeds

A study from Israel which involved analysis of symptomless weed plants from 13 genera and 10 families collected from fields infected with *P. brasiliense*. The report indicated that the bacteria was isolated only from *Malva niaceensis* suggesting that the weed might serve as an alternate host for *P. brasilense*. My study indicated detection by PCR from one crucifer weed collected from heavily infected field. There was not any sign of infection in this suspected weed and an attempt to isolate the bacteria from the extracts from the weed did not give any positive result. Therefore, the role of weeds in survival of *Dickeya* and *Pectobacterium* is not established until this day. The experience from other countries in Europe is also consistent to our observation in

Finland despite the preliminary report from Israel which implicated *Malva niaceenis* as a potential alternate host.

2.2. Survival in irrigation water

A presentation from South Africa "Irrigation water as inoculum source of soft rotting bacteria" confirmed earlier findings of isolation of *Dickeya* and *Pectobacterium* from water courses and rivers of several countries. *Dickeya* species infective to potato were also isolated from river waters in Finland by Laurila and co-workers. The report from South Africa indicated isolation of *Dickeya* species, *P. brasiliense*, *P. carotovorum*, and *P. atrosepticum* from overhead irrigation water. Most of these isolates caused significant soft rot on potato tubers in South Africa as noted by the speaker. Moreover, It was emphasized that this is an important finding for the South African potato industry, since the potential agricultural irrigation water acting as a source of inoculum of soft rot rotting enterobacteria could be a limiting factor since irrigation is widely used in potato production in South Africa. However, none of these findings are very conclusive as to the role irrigation water in the outbreak and epidemiology of blackleg in potato.

The quest for alternative infection sources, if exist, has to continue and have to be properly identified. There are still unanswered questions. For example, questions such as where does infection of "pathogen free" first generation potato crop grown from mini tubers come from? need to be answered for better understanding of the ecology, epidemiology and management of the disease.

3. Diagnostics

A presentation from BIOREBA " Detection of quarantine and blackleg disease causing bacteria in potato by PCR", a company in Switzerland with long experience in plant disease diagnostics and my own presentation "Fifteen years of monitoring, detection and characterization of soft rot and blackleg causing bacterial species of *Dickeya* and *Pectobacterium* in the High Grade seed potato growing area of north Finland" which highlighted advances in diagnostics of *Dickeya* and *Pectobacterium* at LUKE, Oulu, dealt with, among other things, the current status and future prospects of diagnostics in the management of blackleg and soft rot problem. While the current diagnostic primers and probes detect the known species of *Dickeya* and *Pectobacterium* on potato, the effort to develop a more versatile and robust detection methods, taking advantage of the whole genome sequences in public data base for the design of more specific primers and probes, need to continue. Besides, we need to consider the option of newly emerging species or strains which cannot be detected by currently available primers and probes. Diagnostics is dynamic and evolving. Emphasizing on this dynamic and evolving nature of diagnostics, I concluded my talk with my favorite and more than 80 years old, but still valid, quote:

> "*We need better methods for diagnosis: none of the methods given are to be considered as 'standardized' to think of them in such a way would put an end to efforts of improvement. They are useful only until better procedures can be developed" (Riker & Riker, 1936)*

More and more laboratories are currently using Quantitative Real Time Polymerase Chain Reaction (qPCR). It is a method of choice particularly for sensitivity and specificity of detection and following the reaction in real time and reduced work flow such as gel electrophoresis. However, attempt to establish inoculum amount from quantity of bacteria or DNA generated by qPCR to disease has been very challenging.

4. Blackleg and soft rot management

Two presentations "Use of disease suppressiveness in the battle against potato blackleg" and "Characterization of *Pectobacterium carotovorum* subsp. *brasiliense i*n Israel and seed treatments to control tuber soft rot" reported preliminary results. The first presentation indicated seed borne suppressiveness against *D. solani* exist. Microbiome networking, and other plant related factors were investigated but the mechanism is not yet known. Investigations along these lines and association with some metabolites are promised in the presentation.

The evaluation of seed tuber treatment on reducing seed decay which included dry steam, oxolnic acid mancozeb, MB5K (surface sterilizing agent) indicated that all treatments reduced seed decay. However, it was emphasized that the results were generally inconsistent.

5. Concluding Remarks

The conference which brought together experts and representatives from almost all continents created a special forum for acquiring some up to date knowledge and information about potato diseases and pests of economic importance. Global approaches are required to combat diseases and pests in the current globalized world economy where free trade and fast transportation aggravate the spread of pathogens and pests. Such gathering of scientist of interdisciplinary nature is one step towards this effort. In addition such interaction and networking maximizes impact especially at this age of shrinking government investments in agricultural research in the world and diminishing human resource capacity in applied plant pathology and diagnostics through exchange of expertise and research materials.

6. Acknowledgement

The trip was financed by the project "Siemenperunatuotannon varmistaminen (41007-00010700)"