TECHNICAL SHEET

The syndrome « basses richesses » (SBR)

Figure 1: *Pentastiridius leporinus (Ref: Louis Westgeest)*

IN SHORT

The syndrome 'basses richesses' (SBR) is a sugar beet disease induced by two plant pathogenic bacteria and transmitted by a planthopper.

SBR symptoms include yellowing and chlorosis of older leaves, lanceolated and asymmetric new leaves and necrosis of the vascular root bundles.

Main consequence is strong sugar content reduction (up to 5 % absolute) but also root yield can be reduced by more than 25%. SBR can as such lead to significant economic losses for growers and sugar industry.

Differences in SBR tolerance between varieties do exist. This opens perspectives for SESVanderHave breeder to develop a long-term solution.

INTRO

The syndrome 'basses richesses' (SBR) is an emerging sugar beet disease. The disease has been observed for the first time in Eastern France but has now spread to other sugar beet growing areas in Germany, Hungary, and Switzerland. Other countries such as Czech Republic, Slovakia and Italy might be infected as well.

The disease is caused by two bacterial parasites of plant phloem tissue. Both contribute to the disease in different proportions:

- **Major cause:**
  a y-3 proteobacterium (Candidatus Arsenophonus phytopathogenicus)
- **Only occasionally present:**
  a stolbur phytoplasma (Candidatus Phytoplasma solani)

A cixiid planthopper called Pentastiridius leporinus (Figure 1) has been identified as the main transmitting vector of both bacteria.

DISEASE CYCLE

Vector life cycle

The plant hopper adults live only a few weeks. They lay eggs in the soil, near sugar beet roots that will hatch about two weeks later and develop into young insects by feeding on beet roots until harvest causing loss of root yield and sugar content cf 'syndrome basses richesses'. After a winter diapause, the nymphs finish their development on a second crop, typically winter wheat. They can however also overwinter on corn roots, celery, chives, and cabbage. Adults move back to neighboring sugar beet fields starting end of May till beginning of August to restart their cycle (Figure 2). In hot summers however, a second-generation plant hopper can fly from end of August till mid-September.

The insect acquires the proteobacterium at adult and larvae stage while feeding (called horizontal transmission). The proteobacterium can reproduce in the insect, both in the larval and in the adult stages. The leafhopper is also able to transmit the proteobacterium to its progeny: up to 30% of the eggs of an infected female carry the bacteria (called vertical transmission).

Contaminated beet regrowth in cereal fields represent a reservoir for SBR and can, if not removed by chemical or mechanical weed control, contribute to maintain the insect in the soil.

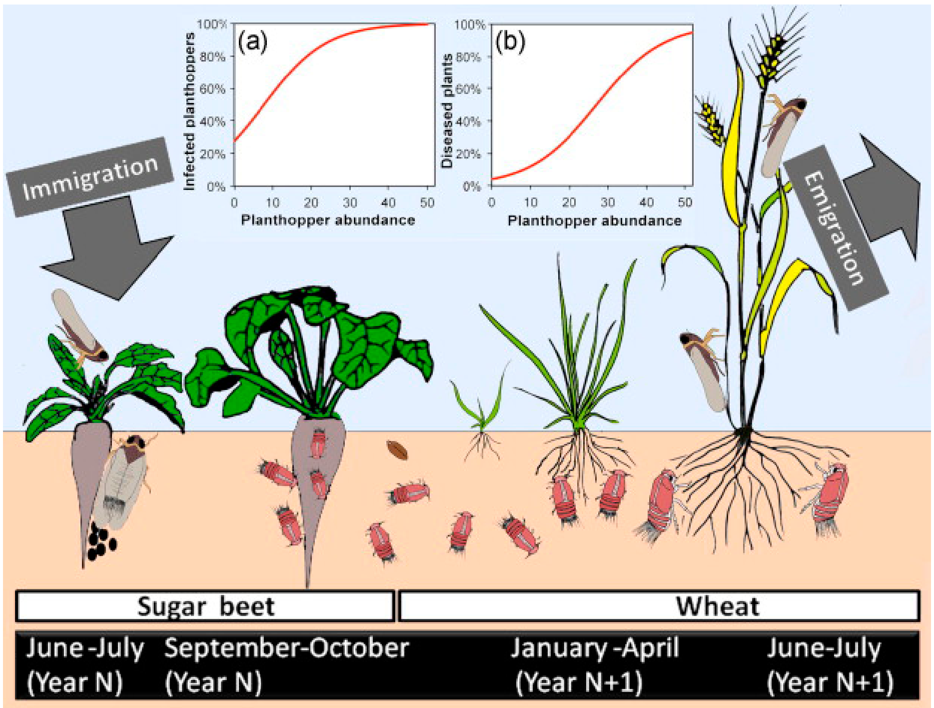

Figure 2: Expected life cycle of the P. leporinus plant hopper in the rotation of sugar beet and winter wheat. (Modified according to Bressan et al. (2011).

Disease symptoms

LEAVES

Symptoms appear in the later part of the summer. The main visible damage at field level is a pronounced yellowing of the leaves (although not always homogeneous over the whole canopy). Leaves show chlorosis and necrosis while leaf veins remain green (Figure 3).

This affects most likely negatively the photosynthetic efficiency of the plant, impacting both root yield and sugar content. New leaves appear malformed, chlorotic, lanceolated and asymmetric (Figure 4). Infested plants often develop more new leaves than non-infested plants.

Figure 3 & 4: Typical leaf symptoms on both older and young leaf development

ROOTS

On roots, the main visual symptom is a brown coloring of the vascular bundles, caused by systemic invasion of the bacterium (Figure 5).

Plants showing the combination of yellowing, strong new leaf development and browned vascular bundles in the root have a very high probability of SBR infection.

The presence of the proteobacterium can be confirmed by PCR analyses and help excluding other causes.

Figure 5: A typical brown coloring of the vascular bundles in the root due to SBR

PERSPECTIVES

Currently, different agronomic measures such as rotation and tillage type are being studied. Furthermore, SESVanderHave screens different genetics to develop a solution for the longer term.

INTERVIEW WITH SESVANDERHAVE EXPERTS

Erik de Bruyne
BIOTIC STRESS PLATFORM MANAGER

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CAN YOU TELL US ABOUT EMERGENCE OF THIS DISEASE?

EdB: SBR disease is caused by plant pathogenic bacteria and transmitted by a plant hopper. This plant hopper is widely distributed throughout Europe, Asia and North-Africa. The insect is typically observed in wetlands. It seems to have been able to shift between hosts. This is probably the main reason for the recent emergence of the SBR disease.

WHERE HAVE WE OBSERVED THE DISEASE?

EdB: The syndrome "basses richesses" (SBR) was first observed in Bourgogne and Franche-Comté in Eastern France in 1991. In 2005, the disease was also found in Hungary. In 2008, several fields in Germany near Heilbronn (Baden-Württemberg) showed SBR infection. Another outbreak followed in 2011. Meanwhile the disease has spread largely in Baden-Württemberg, becoming a major threat for sugar beet growing in this area. In Switzerland, first suspicious cases were recorded around 2000. SBR was present in the district of Gros-de Vaud in 2017 and has spread further since then, covering today around 2000 ha. More countries could be involved.

CAN THE SYMPTOMS OF SBR BE CONFUSED WITH ANY OTHER DISEASE?

NW: The above ground symptoms of SBR are yellow chlorosis and necrosis of the older leaves. Yellow chlorosis symptoms can also be caused by other biotic or abiotic stresses such as drought stress, yellowing virus infection or nutrient deficiency. It makes the interpretation of the visual symptoms often difficult.

CAN SOMETHING BE DONE TO CONTROL THE DISEASE?

NW: Direct control of the bacteria is not possible. Their phloem restricted presence protects them against any bactericidal treatment.
Insecticide treatments could reduce the immigration of the plant hopper into sugar beet fields. Success is however limited due to combination of long spreading period of the planthopper and the short-term effect of insecticide applications especially during summer at high temperatures. And, we should not forget that the insect spends a large part of its life cycle in the ground which makes it difficult to use insecticides.

WHAT AGRONOMIC MEASURES COULD BE TAKEN TO CONTROL THE PLANTHOPPER?

NW: The leafhopper seems to mainly depend on sugar beet and winter wheat to complete its life cycle. Studies show that replacing winter wheat by spring barley could reduce the number of nymphs and adults. Also reduced tillage techniques seem to contribute to reduce the nymph populations, but further research will be needed.

IS SESVANDERHAVE AS SUGAR BEET BREEDER WORKING ON A LONGER-TERM SOLUTION?

EdB: Differences in SBR tolerance between commercially grown sugar beet varieties have been noticed. This variation offers the SESVanderHave breeders perspectives to develop a longer-term solution.

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