Pink Seed in Pulses

Bruce Barker

Pink seed in pea crops has been observed in isolated cases over the past few years. It is caused by *Erwinia rhapontici*, an opportunistic bacterial plant pathogen. The symptoms can be very striking with infected seeds becoming shriveled and turning an intense red color, and can sometimes be confused with seed treatments – but the color cannot be washed off the seed. W. A. Grain & Pulse Solutions at Innisfail, AB report yellow peas are most noticeable, because the pink kernels stick out, causing concern from buyers. Next noticeable are green peas and faba beans. Pink seed has occasionally been bad enough to cause buyers to wonder if they were treated with seed treatment chemicals.

Pink peas are a grading factor in feed peas, and are included in either “damage” counts or “peas of other colors” (POC). The CGC grading guide has two per cent POC allowed in Number 2 Canada yellow peas and one per cent in Number 2 Canada green peas. Overall color is a factor when there are other damaged seeds, and total damage is usually the concern because of hail. In most cases, the peas end up as feed because of other damage in addition to the discolored seeds.

Pink seed was first described in Alberta on pea in 1990. Subsequently, Agriculture and Agri-Food Canada (AAFC) researchers Hung-Chang Huang and Scott Erickson identified it on common bean in 2001 in southern Alberta and in 2002 on lentil and chickpea in Saskatchewan.

In addition to seed discolouration, research has also found that planting seeds infected with *E. rhapontici* can affect plant development and seed yield, as well as reduce emergence and seedling vigour. Huang and Erickson discovered that the use of pea seed infected by the pathogen resulted in an average 33 per cent reduction in seedling emergence, and a 44 per cent reduction in seedling vigour (height).

Huang and Erickson also found that planting infected seeds can result in infection of the seedling and lower parts of the plant such as roots and basal stem. However, there is no evidence that it spreads further upward to the seeds produced by those plants. Thus planting infected seed does not directly cause higher incidence of pink seed, but could be a source of inoculum and planting infected seed is not recommended.

Pathogen Biology

*Erwinia rhapontici* is one of the few bacterial species that cause a distinct pink seed. It also causes crown rot or soft rot in vegetable crops. Research has found the pathogen may lack host specificity, meaning it may be able to infect a wider range of crops than research has identified. In the early 2000s Huang and Erickson found that seven different strains of *E. rhapontici* caused infection on peas and beans, and that a strain from peas could infect kernels of durum wheat. Other research has found the pathogen can infect wheat, durum, rye, pea, bean, lentil, and chickpea.
The pathogen can overwinter on pea seed and residue. Huang and Erickson found surface survival rates of the pathogen from November through March were 88 per cent on infected seeds and 70 per cent for infected stems. By May, the infection rate had declined to approximately 50 per cent on seeds and 44 per cent on stems. A similar trend was seen when buried to six centimetres depth.

Research literature indicates that *E. rhapontici* is an opportunistic bacterial plant pathogen. It usually infects the host plants through wounds caused by insect feeding by pests like aphids, wind, or hail damage. Huang and Erickson confirmed that pea infection was only induced by direct pod injection and not by other inoculation methods, indicating that *E. rhapontici* is a wound pathogen. When pea plants were gently injured with a wire brush at the young pod stage, followed by immediate irrigation (similar to a hail storm), higher frequencies of infection were found in the harvested seed, along with 19 per cent lower thousand kernel weight and an average 44 per cent lower yield than uninfected pea plants regardless of whether the pea plants originated from healthy or infected seeds.

In addition to the presence of wounds, prolonged periods of high humidity are conducive to infection by *E. rhapontici*. Plant injury and a subsequent period of high moisture are major factors that predispose dry peas to development of pink seed disease – similar to conditions found after rain or hail storms. The movement of the pathogen from plant to plant is not clear, but could possibly include transfer by rainfall or insect vectors.

**Control Measures**

The use of seed free from *E. rhapontici* infection is a recommended practice, as the pathogen can be seedborne. Fungicidal seed treatments are not effective as the pathogen is a bacteria rather than a fungal pathogen. Because of the risk of antibiotic resistance, no new antibiotics are likely to be registered for use against plant pathogenic bacteria.

The wide range of host plants suggests that crop rotation between cereals and pulse crops may not be an effective method for control. Further research is needed to understand the host range and survival mechanisms of *E. rhapontici* before crop rotation could be used in cultural control practices. However given that the pathogen infects most pulse and cereal crops grown on the Prairies, crop rotation is not likely feasible as a management tool.

Given the sporadic occurrence of the disease and the association with infection after hail storms or insect feeding, the best practice that a grower can currently implement is to use infection-free seed, and then hope insects nor hail come along to aid infection.

**Key Points to Remember With Pink Seed in Pulses**

1. Caused by *Erwinia rhapontici*, an opportunistic bacterial plant pathogen
2. Infects peas, beans, lentils, chickpeas, faba beans, wheat, durum and many other crops
3. Can cause yield and quality losses
4. Associated with hail damage
5. Limited control options
**Image 1:** Pea seed infected with *Erwinia rhapontici* on the right with healthy seed on left. *Source: Agriculture and Agri-Food Canada*