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NON-SPECIFIC PHYSIOLOGICAL DISEASES IN RAPESEED (OILSEED RAPE)

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Abstract: *The paper reviews non specific physiological diseases in rapeseed. Climate change affects plants in natural and agricultural ecosystems throughout the world but little work has been done on the effects of climate change on plant disease.*

Soil moisture and temperature (frost) are the most important environmental factors controlling stand establishment. Physical damage from wind, hail and excess water can also be a concern for rapeseed plants at the early stages of development. Understanding the impacts of these environmental effects can help prepare growers to make informed management decisions, and set the crop up for success later in the growing season.

Keywords: *Rapeseed, oilseed rape, frost damage*

INTRODUCTION

Rapeseed, Brassica napus subspecies, napus, is a large winter or spring annual oil crop in the Brassica family and is also known as rape and oilseed rape, and for a specific group of cultivars, 'canola'. Rapeseed is related to mustard, cabbage, broccoli, cauliflower and turnip. Rapeseed plants have yellow flowers with four petals. Rapeseed has a deep taproot and a fibrous, near-surface root system.

Rapeseed is primarily grown for its oil. Rapeseed is is also beneficial as a cover crop and for annual forage. It provides good soil cover over winter to prevent soil erosion, produces large amounts of biomass, suppresses weeds, and can improve soil tilth with its root system.

EXPOSURE

The symptoms of winter frosts depend on the extent of the damage and the time of the damage. In crops overwintering in the rosette stage, frost is manifested by grayish-white coloration of the affected leaves. It is caused by a cold wrinkle of the affected mesophile under the epidermis, where air has penetrated the cavities. Sometimes the leaves are watery and after raising the temperature they lose their typical shape, fall to the ground and secondary rot occurs quickly. In the case of plants that have been lush in the autumn, more severe damage occurs, in which the core is also affected. The leaves, including the vegetative top, are yellow-brown and, according to the development of time, either dry out or rot. In most cases, the lesions cover both the stem and the roots and the plants die prematurely. In some cases, when the roots and stems are not affected, the plants branch out and provide a good harvest. Severely affected plants usually have drooping leaves lying on the ground, with a rotten vegetative top and rotting roots. Even on superficial inspection, it becomes clear that they are not able to regenerate. The lower degree of damage is manifested only by the described symptoms on the leaves, as the vegetative apex, stem and roots remain alive. Such plants are able in the spring to regenerate can provide a good harvest. Plants

with a damaged root collar, which is slightly pinched, represent a certain transition between severe and mild damage.

These plants still regenerate, creating many leaves and lateral branches, but the main stem lags behind in its development and in general the plant forms fewer pods.

Frost is a consequence of climatic factors and the condition of the plants. In other words, low temperatures are not the only reason for poor crop condition. Sometimes underdeveloped plants do not air well enough to low temperatures. Of the climatic conditions, the most dangerous are the large temperature amplitudes and the long-lasting frosts without snow cover. For rapeseed, the constant change of temperature is more harmful than the strong and long-lasting cold. In waterlogged and wet soils, rapeseed is more severely affected by temperature fluctuations and related ruptures in the root system. Flooding of plants in low places in the field can also significantly contribute to frost. Negatively affects the plants in winter and the icy surface of the snow cover. Normal snow cover does not negatively affect the overwintering of rapeseed. Severe frosts below (-15 ° C) without snow cover, alternating with significant warming during the day, are more harmful. The susceptibility of plants during overwintering is also influenced by poor agricultural techniques, attacks by pests and phytopathogenic fungi (white rot, phomosis, etc.).

Rapeseed can also be affected by later spring frosts. If it gets cold at the time when the stems grow, they can be deformed, leading to longitudinal splitting, browning of the surface and local tissue damage. When it gets cold during the flowering period, the flower organs can be affected and the flowering can be delayed and prolonged. In case of delayed frosts in the period of pod formation, they are deformed and atrophied, forming less deformed seeds. Occasionally, mild chlorosis may appear on the leaves. These symptoms of damage usually do not extend to all crops, but to nests or circles according to the stage of development of plants, the terrain of the plot, the condition of individual parts of the crop, their density, the appearance of diseases and pests and more.

Figure 1. Stem splitting can occur after spring freeze events

Figure 2. Flowering racemes are bent over following freeze

Although the symptoms are related to the weather in winter, cold sores can be replaced by some diseases, especially phomosis. Unlike phomosis, the freezing of underground parts and stems does not cause spots typical of phomosis rot.

In some cases, a combined lesion can be ruled out when the plants have been attacked by phomosis in the autumn and subsequently frozen. In these cases, it is necessary to determine which is the primary factor for the lesions. The rule is that weakened and attacked plants die first in winter.

Each year, frost leads to losses to varying degrees. Losses are greater in long winters with severe cold and temperature fluctuations, especially after a previous warm autumn.

The only possible preventive protection against rapeseed frost is to improve the condition and the optimal growth phase before winter. It is optimal that the rapeseed is neither too lush nor too weak. The stem should be rather firm, immature, with the most developed root system possible, which is why it is necessary to pay attention mainly to nitrogen nutrition. Recently, to optimize the condition before overwintering are used for autumn treatment or classic they are morphoregulators or fungicides with morphoregulatory action. In addition to the fungicidal protection against phomosis, they provide pressure on the plants to the ground, hardening of the stems and better development of the root system, and hence a better condition for overwintering rapeseed. In the conditions of extreme winter with large fluctuations in temperatures, these measures do not always help and the crops may be frozen in the spring and completely destroyed.

Figure 3. Damaged stems from late spring cold with secondary attack on the inside of the stem

Figure 4. Damage to the stem from late spring frosts without secondary infection

Longer term effects on the crop include differential maturity, delayed maturity, and reduced plant height. Differential maturity may occur if the freeze wasn't quite severe enough to completely kill the plant, and favorable conditions cause a secondary bloom to occur. Delayed crop maturity results in flowering and grain filling during a warmer period which can reduce yield. If temperatures remain cool during flowering and early grain fill, yield reductions should be minimized. Reduced plant height doesn't necessarily result in reduced yield

It is very important in the spring to assess crops for damage caused by frost. With large volume and severe damage to plants can lead to plowing. In case the plants are viable, all agronomic measures must be applied, including timely fertilization with nitrogen, which will help their rapid regeneration.

Unlike the possibility to apply measures in the freezing of rapeseed, preventive protection against high temperatures is not possible.

When rapeseed sprouts, droughts can cause uneven germination or non-germination. In isolated cases, high temperatures cause the death of sprouted crops, even at sufficiently high soil moisture.

During the flowering period, high temperatures and drought can lead to flower fall and sterility. The flowering period is significantly shortened, the number and size of the formed pods are reduced and the yield is significantly reduced. In extremes, the pods still develop, but they are sterile and seedless.

A specific disease is the wilting of flower buds, the causes of which are never clear, but are probably related to the development of weather and drought. The disease is probably caused by changes in transpiration, by insufficient supply of aboveground parts of the plant with water and nutrients. The symptoms also affect the spring and autumn forms of rapeseed. There are lesions in cases when long periods of cooling and drought are replaced by periods of hot and sunny days. The flowers that are in the middle and lower part of the stem in the budding phase are affected. These flowers turn yellow or fade, dry out and gradually fall off the stem. The flowers in the upper parts of the stem develop normally.

Long periods of drought and heat, when replaced by rainy weather, can lead to cracking of the stems in the later stages of growth, just like cold damage. The exposed internal tissues of the stem in the wound appear provide an opportunity for parasites to attack the rapeseed, as is the case with hail damage.

Growth stage can affect the extent of crop damage depending on how low and how long temperatures were below freezing. Rapeseed is most tolerant to freezing temperatures in the rosette and bolting stages and more susceptible in the flowering and pod filling stages.

CONCLUSION

The amount of frost damage is dependent on various factors including crop stage, degree and length of frost, relative humidity, and presence of rain or dew.

To determine when to swath after a frost, check the extent of damage 2-3 days after the frost. Frost damage will be evident on the outside of the pods, which will often show a white, speckled appearance (caused by ruptured cell walls leaking fluid). Immature and watery seeds will start to leak their inner fluid, and begin to shrivel. The outside of the seeds will begin to turn dark green, instead of a light-medium green. If the majority of the seeds remain turgid, delay swathing to allow for further seed maturity. If the pods are severely damaged and are beginning to desiccate, swath during periods of dew or high humidity to reduce the amount of pod shelling and pod drop.

The sensitivity of plants and the appearance of lesions depend on many factors and the flowering period, soil moisture, the condition of individual plants, etc. During the ripening period, extreme temperatures and droughts can cause rapid drying and brittleness of the pods, cracking and mass falling of the seeds on the ground, as well as less oil content in the seeds.

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