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False Black Chaff in Wheats Carrying the Stem Rust Resistance Gene *Sr2*

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There have been many recent enquiries concerning the appearance of black discoloration on glumes and stems of certain wheat varieties. The symptoms range from faint discoloured patches on the outer glumes, to deep black pigmentation on glumes and stems, especially in the stem region just below the node. These symptoms may indicate one of several possible causes, including disease or physiological disorder.

False Black Chaff or Melanism

The illustration in Figure 1 represents a range of symptom presentation in wheats carrying false black chaff, also known as "pseudo black chaff". The term false black chaff is applied to indicate the distinctiveness of this condition compared to other possible causes of black chaff (see below). Symptoms of false black chaff include brown to black discoloration of the glume extending from slight longitudinal marks to large black areas covering most of the glume surface. In more severe expression, the stem region below the last node may become distinctly discoloured.

Symptoms are sporadic from season to season, generally beginning to appear post flowering, and becoming more noticeable under warm humid conditions as the crop matures. Certain wheat varieties strongly express this character, and there is some suggestion that yield may be compromised in these varieties.

False black chaff is a physiological condition resulting from a deposition of melanoid pigments and is completely associated with the presence of the stem rust resistance gene *Sr2*. This gene has been widely used by wheat breeders for stem rust resistance over more than 80 years and continues to provide useful protection, especially in combination with other genes. Although the association of *Sr2* and black chaff has not been broken, there is nevertheless a range in the intensity of appearance which allows breeders to select for low expression of black chaff and also retain *Sr2* during variety improvement.

Varieties carrying *Sr2*

The following current commercial varieties are known to carry *Sr2* and may show varying levels of false black chaff symptom expression:

Baxter, Brennan, Carnamah, Crusader, Derrimut, Diamondbird, EGA Eaglehawk, Drysdale, Ellison, Eradu, Hartog, Kennedy, Kukri, Leichardt, Machete, Peake, Sentinel, Sunbrook, Sunstate, Sunzell, Ventura, Tennant.

The following varieties express false black chaff symptoms consistent with *Sr2*, although the presence of the gene is currently being confirmed with molecular marker assays and the expression of associated seedling chlorosis:

EGA Burke, EGA Kidman, EGA Stampede, EGA Wylie, Livingston.

Alternative Causes of Black Chaff

There are two further possibilities that may cause similar symptom expression to false black chaff. These diseases are not always easy to distinguish, and so care will be needed in diagnosis.

1. *Septoria nodorum* blotch. This is also known as glume blotch and is caused by the fungus *Septoria nodorum*. Symptoms may be similar to false black

chaff, but pale brown to white lesions develop within the black margin. Here, fruiting bodies of the fungus (pycnidia) may develop that are just visible to the naked eye, but more readily recognised with a hand lens. This disease can be severe in some seasons, and is generally initiated from infected seed or stubble infections from the previous season.

2. *Bacterial black chaff.* This disease is caused by plant pathogenic bacteria belonging to the genus *Xanthomonas*. Symptoms are usually associated with wet and humid conditions, with leaves and glumes potentially at risk. Leaf symptoms comprise dark longitudinal stripes that may have a milky bacterial ooze evident under humid conditions. Glume symptoms include black blotches that may also show some evidence of bacterial ooze. However, the latter is not common and so diagnosis based on symptom expression can be difficult. The disease is seed borne and reported widely from wheat growing regions of the world; it is relatively rare in Australia.

Figure 1. Expression of false black chaff on wheat heads post flowering. Symptoms include brown to black discoloration of the glume extending from slight longitudinal marks (left) to large black areas covering most of the glume (right).



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Rusted plant samples can be mailed in paper envelopes; do not use plastic wrapping or plastic lined packages. Direct samples to:

Australian Cereal Rust Survey
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