INSECT CONTROL

During a season a number of different insect pests can occur on wheat plants and not all these pests are equally injurious. Therefore, the decision to control should be made individually for each pest using the guidelines provided and the particular control measure should be chosen to give the best result in both economic and environmental terms. The correct identification of pests is of utmost importance to ensure that the appropriate control measure is followed. A Field Guide for the Identification of Insects in Wheat is available from ARC-Small Grain. This full-colour guide contains a short description and photograph of each insect and includes both pests and beneficial insects. A pamphlet containing information on the registered insecticides is also included. It is helpful to make use of a magnifying glass when identifying wheat insects, as most of them are quite small. Guidelines for the control of insect pests are discussed below.

Aphids

Five aphid species are commonly found on wheat in the summer rainfall production areas in South Africa. The Russian wheat aphid *(Diuraphis noxia)* is the most important with outbreaks occurring annually, while the other aphids namely greenbug *(Schizaphis graminum)*, bird-cherry oat aphid *(Rhopalosiphum padi)*, brown ear aphid, also called English grain aphid *(Sitobion avenae)* and the rose grain aphid *(Metopolophium dirhodum)* occur sporadically. Generally, Russian wheat aphid and greenbug occur in dryer, low potential circumstances while bird-cherry oat aphid, brown ear aphid and rose grain aphid occur in wetter, high potential environments.

Russian wheat aphid

Russian wheat aphid (RWA) is a small (<2.0 mm), spindle-shaped, pale yellow-green to grey-green aphid with extremely short antennae and a “double tail”(Figure 1).

Figure 1. Russian wheat aphid

Host plant resistance has been the best control option for RWA since the release of the first RWA-resistant cultivar (Tugela-DN) in 1992 and it is recommended to still plant cultivars with résistance. Producers should monitor fields regularly and be aware that it may be necessary to apply insecticides if aphid populations increase.

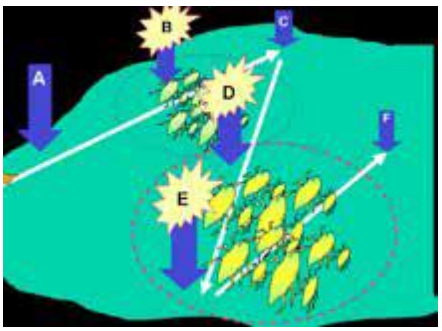
Wheat is most prone to damage by Russian wheat aphid during the period between the emergence of the flag leaf (GS 14*) and the ear (GS 18*). Chemical treatment at GS 12* will ensure that the upper two leaves are protected from aphid infestation and this will reduce yield loss. Spraying before GS 12* is recommended only in cases of severe infestation > 30%, which may occur on the wheat planted during spring in the Eastern Free State or under very dry conditions in the Western Free State. Reinfestation of this wheat may occur during the susceptible period necessitating an additional spray, though some damage may have already occurred with spraying after GS 12*. Infestation levels at various yield potentials, which necessitate spraying, are presented in Table 2. Seed treatments and soil systemic insecticides are available for control of aphid populations and control for up to 100 days after planting is possible (*Growth stages by Joubert).

Table 2. The minimum infestation levels that necessitate spraying against Russian wheat aphid at various yield potentials

Yield potential (ton/ha)	Minimum % aphid infestation per field at GS 12 (Joubert growth stages)
2.0 – 2.5	7
1.5 – 2.0	10
1.0 – 1.5	14

Determining the percentage aphid infestation in a field

By determining the percentage infestation in a field a farmer will be able to decide whether aphids should be controlled by chemical means. If the percentage infestation in a field is equal or higher than the recommendation for that specific field, the eventual yield will, due to Russian wheat aphid damage, not reach the optimum yield potential.



Steps for determining the percentage infestation in a field are as follows: Decide beforehand how many steps will be used as the standard and which foot will be the marker foot.

• Walk into the field for a short distance and then start to count off the number of steps that was decided on. On the specific number of steps, the plant closest to the front of the marker foot is inspected for aphids. Plants are then ticked as either with "aphids present" or "aphids absent".

• This procedure is now repeated throughout the field ten times or more. The scouting route must represent the whole field as aphid infestations usually occur in patches.

• The largest number of repetitions as possible should be scouted as this will increase the accuracy of the percentage infestation.

• Example: Three infested plants out of a total of six repetitions will result in an infestation percentage of 50% (3 divided by 6 x 100).

Other aphids

The oat aphid, English grain aphid and rose-grain aphid are sporadic pests in the summer rainfall area. These aphids prefer thick plant densities with damp conditions like in irrigated fields, but will also be present in wet years in dryland fields. The oat aphid has a dark green pear-shaped body with a red coloured area between the siphunculi on the rear end of the aphid (Fig. 3). A green and brown form of the English grain aphid (Fig. 4) can be found. Long black siphunculi on the rear end are the most outstanding characteristic of this aphid. The rosegrain aphid is pale yellow-green in colour with a dark green longitudinal stripe on the back (Fig. 5). The siphunculi of this aphid are the same colour as the body. These aphids are less harmful than RWA and all three of them can occur simultaneously. Plants are normally infested by these aphids at

flag leaf stage, but oat aphids could occur at the seedling stage. These three aphid species are also known for their potential to transfer plant viruses such as Barley Yellow dwarf virus (BYDV). This virus can cause yield reductions between 30 and 50% depending on the time of transmission.

Because BYDV occurs only in the phloem of the plant, it can only be transmitted through the aphid's saliva during feeding. Population increase occurs after flag leaf stage. Oat aphids prefer to feed on stems of plants, while the English grain aphid, migrates into the head for feeding. Rose grain aphids occur on the underside of the upper leaves and produce large quantities of honeydew, which makes the plants sticky and shiny when large populations are present.

When concerned about normal aphid feeding damage, chemical control can be applied between flag leaf appearance (GS14) and full ear emergence (GS17) when 20 to 30% of tillers are infested with 5-10 aphids per tiller. However, when you are aware of the presence of BYDV in your area, preventative spraying may be conducted at an early stage to prevent virus transmission by aphids arriving early. ARC-Small Grain is currently monitoring migrating aphid numbers using 12m high suction traps in some of the irrigation areas. Data are presented on a weekly basis on the ARC-Small Grain website to inform farmers about the status of aphid numbers present at critical times.

Figure 3. Oat aphid

Figure 4. English grain aphid

Figure 5. Rose grain aphid

(Follow the link http://www.arc.agric.za/arc-sgi/Pages/2017-Aphid-numbers.aspx.)

Be sure that chemical control is applied correctly when necessary, read the label and do the application accordingly. Be careful to ensure the application of the correct dosage, a wrong dosage could necessitate another application which has financial implications and increases the risk of resistance development in aphids. Unnecessary applications should be reduced to a minimum because they also kill the natural enemies, which are important in the control of aphids. When the environment around the fields progress in ecological balance, an increase in natural enemies occurs, which will control the aphids and reduce the control costs.

Other insect pests

Except for aphids, brown wheat mite *(Petrobia latens)*, false wireworm *(Somaticus spp., Gonocephalum sp.)*, bollworm *(Helicoverpa armigera)*, black maize beetle *(Heteronychus arator)* and leafhoppers are considered sporadic, secondary pests of small grains in the summer rainfall region. False armyworm and leaf miners are becoming sporadic pests of irrigated wheat.

Brown wheat mite

These mites are small, dark brown with a slightly oval body; the first pair of forelegs being notably longer than the others. Scouting should be conducted between 9 and 11 in the morning because they hide beneath soil clots during warm and windy periods of the day. White dormant eggs are laid in the soil, which will hatch after light rain in July/August. After hatching, dry conditions will promote population increases with affected plants showing white speckled leaves due to sap-feeding activity. Under severe infestations, leaves may turn yellow or bronze resulting in yellow or brown patches appearing in the field. Chemical control can be considered under such conditions. On the other hand, brown wheat mite damage is more pronounced when

plants are under stress and these conditions are generally inhibitive for the uptake and translocation of systemic insecticides. Producers should also take note that rain showers of 12mm or more can effectively reduce mite populations, thereby negating the need for chemical intervention.

False wireworm

The false wireworm belongs to the family Tenebrionidae and is the larval stage of dark-coloured beetles, about 5 to 10mm long. The larva is the most damaging stage feeding on seed, roots and seedling stems at or just below the soil surface. Adult beetles may damage emerging seedlings. The larvae can grow to 20mm in length and are smooth, hard-bodied and golden-brown to dark brown with pointed, upturned tails. Rotten plant material in the soil may serve as a food source for the beetles and when present during planting time, farmers should use seed treatments to prevent damage.

Bollworm

The adult moths are light brown to grey with a wingspan of about 20mm. The moths fly at dawn and dusk laying their eggs directly on the plant. Young larvae of early season generations initially feed on the chlorophyll of leaves, later migrating into the ear to feed on the developing kernels. Moths of later generations deposit their eggs directly on the ear. Final instar larvae can vary from bright green to brown and have a characteristic lateral white stripe on either side. The larva can reach up to 40mm in length and can cause considerable damage, especially in terms of quality loss and subsequent downgrading of the consignment. The presence of bollworm is generally noticed only once the larvae have reached the mid-instar stage inside the awns. Producers should scout their fields in order to detect the younger larvae, as the older, more mature larvae, are generally less susceptible to insecticides and obviously cause more damage compared to small larvae. Under dryland conditions, a chemical intervention can be considered when 3-4 larvae per meter row are present. A slightly higher threshold of 6-7 larvae per meter is applicable under irrigated conditions with higher seeding density. However, producers should take care in applying the correct dose of registered insecticide under weather conditions conducive to insect control.

Black maize beetle

The adult beetle is black, about 12-15mm in length and capable of extended flight. Females lay about 7-10 eggs in the soil and the larvae develop through three instars followed by a pupal stage. The beetles are the most damaging stage while their larvae survive mostly on organic material in the soil. Adults chew at the base of the seedling stem resulting in a reduced stand. Given the migrating nature of the adult stage, seed treatments are registered as a pre-plant approach toward control of adult beetles.

Leafhoppers and maize streak virus

The leafhopper, *Cicadulina mbila,* is recognized as a pest on wheat since they can transmit maize streak virus from infected maize and grasses. Leafhoppers can easily migrate from maize fields to adjacent early seeded wheat fields. Young infected wheat plants have a stunted appearance with curled leaves showing thin white longitudinal stripes. No chemicals are registered for the control of leafhoppers on wheat. Infestation can be prevented by later planting dates in areas away from maize fields.

Leafminer

A small black leaf miner fly, *Agromyza ocularis* (Fig. 6), infests the wheat and barley crop under irrigation in the Northern Cape, North West and the Western Free State. They have spread during the past two years to the dryland production areas of the Western Cape, where a single early cycle is occurring, mainly on barley. They do not occur in large numbers later in the growing season. At the early stage of infestation, they mine only in the first leaves and then pupate in the soil causing no noticeable damage to the crop. They have also spread to the irrigation areas in the North West and some dryland wheat in the Western Free State. Their occurrence in these areas is at a low level and spraying is not needed. The female drills holes in leaves with her ovipositor and eggs are laid in some, while the rest of the holes (oozing plant sap) are used for feeding. Larvae hatch and feed inside the leaf while they burrow through it, leaving only the two epithelial cell layers as a safe environment for survival. The mined part of a leaf is dead and turns brown with time (Fig. 7) and can't be revived by spraying insecticides. The fully grown larvae escape from the leaf and pupate in the soil (Fig.8). The adult flies hatch from the pupae at a later stage. Although the damage to the plants is noticeable, no significant damage could be measured during field trials and therefore spraying should only be considered in very severe cases. The amount of yield loss caused by this insect is still uncertain.

Figure 6. Adult leaf miner fly

Figure 7. The mined portion of the wheat leaf which turned brown

Figure 8. Leaf miner pupae

False armyworm

False armyworm *Leucania loreyi* is present as a sporadic pest in wheat and barley fields of the Northern Cape, North West and the Western Free State. During grain filling, high larval numbers can consume most leaves of the wheat crop while the beard of some ears may be damaged. Extensive damage could occur on barley when heads are cut-off during feeding by these larvae. Crop damage normally occurs in the last days before the grain is harvested. Both larvae and moths are active during the night and not very visible during the day. Larvae pupate in the soil. This sporadic pest occurs also in irrigated maize. No insecticide is registered against this pest on wheat or barley (Fig. 9).

Figure 9. False armyworm larva