THE BCPC WEEDS REVIEW 2018

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The 55th Annual BCPC Weeds Review "*Building on the basics*" took place at Rothamsted Research on 7th November 2018, with an audience of over 72 invited delegates.

In his chairman's introduction, **Joe Martin,** (AHDB) introduced the review by saying that whereas the focus for 2017 had been the future for weed management, the purpose of 2018 was to look back at the basics of weed biology, some possibly forgotten, which could help address weed management issue in the future.

Prior to this there was a short synopsis of the weather in 2017/18 compared to the 30-year mean (1981-2010) by **Peter Lutman** based on the national weather data from the Meteorological Office website. This was then used to explain agricultural implications. A relatively benign August and September and warm October led to late drilling of autumn crops and favoured pre-emergence herbicides. Planting of spring crops was a challenge due to wet and cool conditions. The hot and dry summer this year has meant that many grain crops matured early, leading to yield losses (estimated at 5% for wheat and 8% for barley).

Bob Froud-Williams an independent consultant presented the 'Biology of Weeds: A ramble down memory lane'. Bob gave a generalised view of the basic life cycle of annual weed species in relation to their fecundity, dispersal, predation and incorporation into the soil seedbank. He considered soil seedbank in relation to size, distribution, persistence and seed dormancy. He also discussed the mechanisms regulating periodicity of germination through cyclic changes in dormancy and subsequent seedling emergence. Finally, Bob presented the effect of maternal environment, positional factors and somatic polymorphism on seed dormancy and germination requirements for some grass and broad-leaved weeds. Much of the data cited was from weed biology research 40-50 years ago and awareness is necessary today when dealing with weed management issues. One further take-home message from this brief review is that each weed species has its own properties and characteristics which must be taken into account in its control.

John Cussans (NIAB) presented Weed Seedbank in Practice. Practices such as spring cropping, fallowing, ploughing, delayed drilling, higher crop seed density and competitive crop cultivars have variable impacts on seedbank with reductions of 80%, 70%, 67%, 37%, 30%, and 27% respectively. Whilst spring cropping gave the highest reduction, it is not always the answer. Understanding the status of the seedbank and where the seeds are distributed within it is key for seedbank management, along with understanding its interaction with environmental conditions particularly soil moisture; the crop and its ability to suppress weeds; the interaction of agronomy, crop rotation and weed control and attention to detail.

Paul Fogg (Frontier) presented the Arable Perspective – Harvest weed seed control – the value of chaff tramlining. This harvest weed seed control (HWSC) approach was pioneered in Australia as part of an integrated approach to control herbicide resistant ryegrass populations (see Walsh 2018. Development of Harvest Weed Seed Control (HWSC) in Australian Cropping Systems *Outlooks on Pest Management* **29**(3) 114). Up to 95% of weed seeds can, in theory, enter the combine header and the chaff-fraction discharged at the rear of the machine. A range of approaches have been trialled and are used commercially in Australia, including chaff carts, direct baling, weed seed destruction and chaff tramlining. Using approaches to manage the chaff, rather than spreading it ahead of next season's crop clearly could have value on UK farms, particularly where black-grass (*Alopecurus myosuroides*), ryegrass (*Lolium* spp.) and brome (*Bromus* spp.) are an issue. UK trials focused on chaff tramlining given the low capital outlay, running cost and horse power requirements of the chaff deck. Three clear objectives were set at the start of the project: to investigate the relative amount of black-grass seed retained at harvest; to establish whether the chaff deck would work in a range of UK crops and to see what proportion of the weed seed fraction could be consolidated into the chaff tramlines. After two years of trials, initial results are encouraging. The amount of black-grass retained varies depending on harvest date. Data confirm that weed seeds are being effectively consolidated, such that over the course of a rotation and provided the soil seedbank is left undisturbed we should start to see fields being "cleaned up". Working on 5 farms for harvest 2018, the chaff deck has performed well in a range of combinable crops with the straw either left in the swath or chopped.

Daniel Jones (Advanced Invasives) presented the Amenity Perspective – Japanese knotweed; Ecology and Evidence. Knotweed (*Fallopia japonica*) is the most notorious invasive non-native plant in Britain. Knotweed and its close relatives impose serious management costs on homeowners, developers and large landowners alike. This presentation discussed current research on knotweed rhizome ecophysiology, exploring how this is integral to effective knotweed control and the sustainable management of other rhizome-forming species. Of the nineteen knotweed treatments investigated only 3 were statistically effective and all involved glyphosate: biannual foliar spray; stem injection; and annual foliar spray. Stem injection was dose inefficient at present requiring a much higher glyphosate dose compared to foliar spraying leading to the conclusion that more glyphosate is not better.

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The morning session was completed with the new scientist poster pitch session where students gave a short presentation on their posters.

Helen Metcalfe (Rothamsted Research) used functional traits to model plant communities in arable fields. A range of traits such as plant height, seed size, specific leaf area and flowering time were used to model multiple (136) weed species which were considered a product of environmental and management filters acting on the weed community.

Sophie Hocking (Swansea University) investigated life after knotweed and recovery of invader dominated habitats.

Laura Davies (ADAS) investigating the distribution and presence and potential for herbicide resistance of UK brome species in arable farming.

Vian H. Mohammad (University of Sheffield) demonstrated that drought stress elicited heritable herbicide resistance in the grass weed *Alopecurus myosuroides* (black grass).

After lunch, two presentations focussed on optimising herbicide performance

James Southgate (Syngenta) presented the 'slow and low' campaign for pre-emergent herbicides. Due to the increasing challenges of grassweed control, growers need to take advantage of every cultural and chemical option to keep populations in check. A particular area which can be optimised includes pre-emergent herbicide application timing. Syngenta has spent multiple years thoroughly researching the interaction of water volume, forward speeds, boom height & nozzles on herbicide efficacy. The results of which can be simplified into three key messages Go Low, Go Slow, Get Covered.

Claire Butler-Ellis (Silsoe Spray Applications Unit) reviewed how application technique can influence herbicide performance. This started by a look back in history and a 1994 review concluded a lack of consistency from studies with post-emergence herbicides and often no clear trends identified. Performance improved with reducing droplet size and was most consistent for systemic herbicides. Optimum volume rates were between 100 and 400 L/ha although this was not always clear for all herbicides, although glyphosate had consistently better performance for reduced volume. Since 1994 we have had the introduction of air-induction and angled nozzles, loss of chemicals, improved formulations but it was claimed that we know less now than we did 24 years ago. More recent findings from formulation studies suggest that firstly, low application volumes may give better efficacy performance than high, due to greater plant retention. A higher concentration may be more important than higher 'coverage'. Secondly, where a high level of coverage of the plant surface by water is genuinely beneficial, higher volumes may work best.

The final two presentations covered Weed identification

Firstly, **Stephen Moss** (Consultant) covered the identification of Brome (*Bromus* spp). Spikelet morphology aids identification. Those of sterile or barren brome (*B. sterilis*) and great brome (*B. diandrus*) are wedge-shaped whereas those of soft brome (*B. hordeaceus*), meadow brome (*B. commutatus*) and rye brome (*B. secalinus*) are more oval shaped. Sterile and great brome can be differentiated based on length of spikelet e.g. 40 – 60 mm (sterile) or 70 – 90 mm long (great) (including awns). Sterile brome has a hairless main stem of the panicle (flowering head) whereas that of great brome is hairy. Soft brome has hairy spikelets whereas those of meadow brome are hairless. Rye brome which can have either hairy or hairless spikelets can be differentiated from meadow and soft by a V- or U-shaped seed saucer, which has a white cross section in meadow and soft brome. The panicle of soft brome is compact whereas that of meadow and rye is loose.

The identification of the 5 main species was stated as being important because different control measures are necessary for sterile and great brome compared with soft, meadow and rye brome, in relation to post-harvest cultivations. Label claims for control of different brome species vary. Great brome is generally considered a more challenging species than sterile brome. Rye brome is generally considered a more challenging species than meadow or soft brome. Emergence patterns and seed survival may vary between species and populations.

Secondly, **Sarah Cook** (ADAS) covered the identification and distribution of Umbellifers (*Apiaceae*). Members of the Umbelliferae include edible plants such as carrot, celery, parsley, coriander, parsnips, poisonous plants such as hemlock, hemlock water dropwort and fool's parsley. Currently umbellifers are trending in world of floral art and are prized for their open airy flowers and foliage. There are 73 species of umbellifers described in the BSBI handbook No 2 – Umbellifers of the British Isles, of which less than 10 are commonly found in arable fields. The most likely species are *Aethusa cynapium* Fool's parsley; *Anthriscus sylvestris* Cow parsley; *Anthriscus caucalis* Bur chervil; *Daucus carota* Wild carrot; *Petroselinum segetum* Corn parsley; *Torilis arvensis* Spreading hedge parsley and *Scandix pecten-veneris* Shepherd's needle;

Joe Martin concluded the review by stating that weed control was not straightforward and that we need to learn from the past. There is a need for attention to detail, considering factors such as weather and resistance and to share this information. Finally, there is still a need for research but it was recognised that funds for this are diminishing.