Weed management: 60 years of experience

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BCPC Annual Review of Weed Control, 2 November 2023
Weed management: [over] 60 years of experience

• Weeds not new and divide opinion
• Leading others: weed reviews and collaboration
  • Sound evidence-base in research and publications
• Comings & goings!
  • Cultural control (rotation, cultivation, preventing seed dispersal)
  • Herbicides & application
  • Changing weed problems
• Challenges for herbicides
• Your reflections (survey)
• Future priorities
Cut thistles in May, They'll grow in a day. Cut them in June, That is too soon, Cut them in July, Then they will die.

“Then plough deep, while sluggards sleep, and you shall have corn to sell and to keep.” — Benjamin Franklin

One year’s seeding makes seven years weeding.
Weeds divide opinion

“In my garden it’s anything that’s growing where I don’t want it to grow – or getting too big for its boots”
Mark Griffin, Bedfordshire

“A wild plant that hasn’t been cultivated and, if not watched carefully, may take over”
Sylvia Fairhurst, Greater Manchester

“Weeds are uninvited guests in our gardens, robbing the soil of nutrients and depriving our chosen plants of essential elements”
Graeme Stockdale, Derbyshire

“It’s just a plant that is growing in the wrong place. So a seed potato in my veg plot is fine, but if it’s in my flower bed I’ll pull it up”
Mike Canaway, Greater Manchester

“To me, weeds are a chance to let something new grow”
Irena Peel, Tyne and Wear

“Climate change means it’s time to look differently at weeds. They are good for biodiversity so we should leave them in the garden!”
Lia Wallenburg, The Netherlands

“I believe that no plant is a weed. It’s really just a wildflower growing in an unintended place”
Kate Dickens, Kilmarnock

“Weeds are pretty, supply nitrates back into the soil, fabulous for wildlife and important for biodiversity”
Jennifer Wilkins, Sussex

“I used to pull foxgloves out until I went to the RHS Chelsea Flower Show and realised that they can be very pretty. Now I let them grow where they wish”
Milli Wilson, Northumberland
Young leaves taste like pea shoots. Steam or sauté as a leaf vegetable or eat raw in salads, etc. Dry and roast the seeds, grind them in a coffee grinder and use in a cafetiere.

Chickweed poultice: mash up leaves or make into an ointment to soothe itching, eczema, psoriasis, boils or sunburn.

Used externally, cleavers can ease ulcers and wounds. Taken internally they can alleviate the pain of cystitis. Cleavers can also help to bring down a high temperature.
1950 Agricultural Research Council research unit in Oxford
- ARC Unit of Experimental Agronomy (Director Dr E K Woodford).
- One of objectives was to develop chemical weed control (H$_2$SO$_4$, Cu salts, mineral oils) and the foundations of DNOC, DNBP then MCPA, 2,4-D.
- Several British companies already marketing a few selective weed killers and had massive investment in synthesis and screening.
- Supported by NAAS [ADAS] (J F Ormerod) identified need to promote communication and collaboration between organisations involved with development and use.

5 November 1952 MAFF agreed to sponsor an *ad hoc* meeting to explore attitudes, review current work on weed control and identify outstanding problems and proposals for dealing with them.
- 40 participants from ARC, ADAS, CropLife, NAAC, CABI, NIAB, RRes (LARS & GRI).
- Chair summarises with “weedkillers must be regarded only as an aid to good husbandry and not a substitute for it!”
British Weed Control Council formed; later becomes BCPC

- 1953 2nd British Weed Control Conference (Harrogate)
  - British Weed Control Council (BWCC) constitution adopted and created
  - Objectives were:
    - To promote and encourage science and practice of weed control.
    - To organise conferences on weed control, to publish and sell or otherwise distribute the reports of the proceedings.
    - To disseminate information on weed control.
    - To collaborate with other organisations the objects of which are to encourage the science and practice of crop protection.
    - To do all other lawful things incidental or conducive to the above objectives.
  - Regular Weed Control conferences (Brighton Conferences)
  - Published Weed Control Handbook(s), in early days was basis of efficacy in ACAS

- 1962, success of BWCC, led to formation of British Insecticide and Fungicide Council (BIFC)
- 1965 BWCC & BIFC consider desirability of amalgamation (controversial to some!)
- 28 September 1967, met separately for last time, and immediately formed British Crop Protection Council
Weed management: leading others in reviews and collaboration

- Nov 1952 meeting followed up on 16 December with first ‘Weeds Group’ meeting.
  - Dissemination of weed control information, especially between industry & official bodies.
  - Means of educating public opinion on weed control and spraying matters.
  - Possibility of holding national or regional weed control conferences.
  - Economic aspects of weed control.
  - Possibility of arranging co-ordinated experiments and observations
- 1953 First National Weed Control Conference (Margate) & formation of what became British Weed Control Council (BWCC)
- 1956 First biennial British Weed Control Conference (1745 delegates, 132 papers in 3 volumes)
- 1960 European Weed Research Council formed & Weed Research published (EWRS since 1975)
- 1979 International Weed Science Society formed
Research base: government-funded research institute(s)

- Weed Research Organisation (from 1960)
  - 79 scientists; total 135 staff
- Long Ashton Research Station (1986)
  - c.30 staff
- Rothamsted (1990)
  - 4 staff (GC, PL, SM, AM)
Evidence-based publications

Sound foundations in science and communication of knowledge

• Weed Management Handbook 2002

• Weed biology

![Image of books and book covers related to weed control and identification]
BCPC review agendas and proceedings: constants and evolution

1973 10th Review

- Problem weeds
- Herbicides & efficacy

1983 20th Review

- Application & drift

1993 30th Review

- Disposal & washing

2003 40th Review

- Loss of herbicides

Herbicides & efficacy

Application & drift

Disposal & washing

Loss of herbicides
Decades of weed management experience: changing decades

Pre 1940s herbicides

Copper sulphate (selective in cereals)
- 1896: France
- 1898: GB

Ferrous sulphate, sulphuric acid, sodium chlorate
- 1901-19: Europe & USA
- 1930s substantial in GB

Dinitro-phenols & cresols
- 1932-33: France
Decades of weed management experience: changing decades

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<tr>
<th>Decade</th>
<th>Herbicides</th>
<th>1940s</th>
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<tr>
<td>Pre 1940s herbicides</td>
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<td>2, 4-D</td>
<td>Atrazine</td>
<td>TCA</td>
<td>Paraquat</td>
<td>Simazine</td>
<td>IPU</td>
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Decades: 1940s, 1950s, 1960s, 1970s, 1980s, 1990s, 2000s, 2010s, 2020s

Herbicides: 2, 4-D, Atrazine, TCA, Paraquat, MCPB, Simazine, IPU, IPU, ALS, Flufenacet, Aminopyralid, Cinmethylin

Products: Chemicals, Products

Years: 1950s, 1960s, 1970s, 1980s, 1990s, 2000s, 2010s, 2020s

GB independent of EU (2021)

PSPS (1957)
BASIS (1978)
FEPA (1985)
COPR (1986)
91/414
1107/2009 VI (2001)


Chemicals 11 36 72 81 119 112 94 84
Products 104 260 452 461 1,346 1,560 1,497 1,386
Changing herbicide availability: **Losses, new to UK, new to all**

<table>
<thead>
<tr>
<th>Active Substance</th>
<th>Introduction</th>
<th>No longer available*</th>
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<tbody>
<tr>
<td>Amitrole</td>
<td>1953</td>
<td>2016</td>
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<tr>
<td>Atrazine</td>
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<tr>
<td>Benazolin</td>
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<td>Carbetamide</td>
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<tr>
<td>Chlorpropham</td>
<td>1951</td>
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<tr>
<td>Desmedipham</td>
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<td>Diuron</td>
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<td>Flupyransulfuron</td>
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<td>Oxadiazon</td>
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<td>Simazine</td>
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<td>Tepraloxydim</td>
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<td>2015</td>
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<td>Terbutryn</td>
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<td>Tepraloxydim</td>
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<td>Trifluralin</td>
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<thead>
<tr>
<th>Active Substance</th>
<th>Global</th>
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<tr>
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<td>Cinmethylin</td>
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<td>Prosulfocarb</td>
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<th>Active substance</th>
<th>UK</th>
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<tr>
<td>Aminopyralid</td>
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<td>Mesotrizone</td>
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<td>Pinoxaden</td>
<td>2016</td>
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<tr>
<td>Pyroxsulam</td>
<td>2014</td>
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<tr>
<td>Quizalofop</td>
<td>2015</td>
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- * No longer available due to EITHER regulatory decision OR company decision
- Some active substances will have received rate or timing restrictions (e.g. to meet revised bird or mammal assessments, buffer zones)
- The future: Endocrine disruption? NTP or biodiversity? Water protection?
Changing balance of weed management practices

- Bio-control
- Cultural
- Herbicides
Weed control was manual and back-breaking work.
Horsepower helped
Mechanical and technological assistance
Herbicide application
Alternative weed control approaches

- Electric
- Laser
- Foam
Changing weed problems

Under new management

Wild-oats
Couch
Cleavers
Challenges for herbicides

- Herbicides of greatest concern for water quality
- Herbicide resistance
- Very challenging to develop & authorise new herbicides
- Non-target plants?
- Selectivity?
- Integrate herbicides & cultural
  - within field and rotation

<table>
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<tr>
<th>Pesticide</th>
<th>Number of SgZs for pesticides</th>
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<td>Bentazone</td>
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<tr>
<td>Metaldehyde</td>
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<tr>
<td>Atrazine</td>
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<td>Other pesticides</td>
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<td>Diuron</td>
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<td>Mecoprop</td>
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<td>Monuron</td>
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<td>Oxadixyl</td>
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<td>Picloram</td>
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<td>Propyzamide</td>
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<td>Simazine</td>
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<td>Total</td>
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The 2023 BCPC Weeds Review marks 60 years of sharing experiences of weed control challenges and successes. To highlight this landmark, the organisers have asked some speakers to explore influences, changes and successes over the past 60 years which will also inform future needs. **We welcome your reflections** in this. The survey outcomes will provide a topic of discussion at the review on 2 November.

Please find about 10 minutes to provide your experiences on weed control in your career to date, and to help highlight emerging priorities. The [survey](#) (which may be shared with colleagues) will be open until **15 October** and is accessible to anyone with the [survey link](#) or by scanning the QR code. It is suitable PCs and mobile devices.

Thank you.
Profile of survey responses (36 received)

When first started working in weeds:

- Pre 1970
- 1970s
- 1980s
- 1990s
- 2000s
- 2010s
- 2020s

Work/activity:
- Advice/technical: 56%
- Research: 33%
- Contracting: 3%
- Farmer/grower: 0%
- Other: 8%

Age:
- Under 30: 6%
- 30-40: 14%
- 40-50: 19%
- 50-60: 25%
- Over 60: 36%
Profile of survey responses (36 received): mainly field crops

Main sectors worked:

- Arable ( combinable): 36
- Arable (roots): 15
- Grass/forage: 10
- Top fruit: 5
- Soft fruit: 3
- Field vegetables/salads (outdoor): 5
- Hardy Ornamentals/Bedding plants/Cut flowers...: 3
- Protected crops (under fixed glass/polytunnels): 3
- Amenity leisure: 3
- Amenity transport: 3
- Amenity Infrastructure/other (e.g. solar): 3
Profile of survey responses (36 received): distribution reflects main production

![Bar chart showing main area worked.]

- **International**
- **Scotland**
- **Wales**
- **Northern Ireland**
- **South West England**
- **South East England**
- **Eastern England**
- **East Midlands England**
- **West Midlands England**
- **North West England**
- **North East England**
Worst weeds

- Autumn germinating annual *grass-weeds*
- Spring germinating annual *grass-weeds*
- Autumn germinating annual *broad-leaved weeds*
- Spring germinating annual *broad-leaved weeds*
- Perennial *grass weeds*
- Perennial *broad-leaved weeds*
- Other
Weeds which most influence decision making
Importance of weed management measures: to date (left) and in 10 years (right)
Decade when weed management was easiest and most successful
Challenges in next 5-10 years

- Lack of available active substances/product choice
- Resistance management
- Protection of water
Weed management in 2035

- integrated
- difficult
- cultivations
- targeted
- electrical
- automated
- new
- species
- mechanical
- rotations
- weed
- diversified
- crop
- control
- non-chemical
- management
- increased
- ipm
- precise
- herbicides
- sustainable
- combinations
- hybrid
- application
- practices
- id
- better
- fewer
- spatial
- sensible
- improved
- resistance
- greater
- use
- due
- grass
- techniques
- cultivation
- legislation
Views on the future

- Farmers and society will accept more weeds
- Crop rotations will change due to weed issues
- Glyphosate will be a major control option
- Bioherbicides will be common in 10-15 years
- Application technology will revolutionise our opportunities
- Precision/part-field spraying will be common place
- Stubble burning will return
Attempts to change from chemical to mechanical divide opinion

Brighton: Council criticised after asking for volunteers to pick weeds

The council has been told to weed the pavements itself after an “outrageous” scheme asking for volunteers to help do the task by hand. Brighton and Hove City Council has come under fire for calling for “weed warrior” volunteers to help its staff clear the city’s 975,000m of pavements.

It has been trialling manual techniques such as mechanical sweepers, industrial grade strimmers and “good old fashioned hoes” since the decision to ban toxic chemical weedkillers in 2019, under the Labour administration.

https://www.theargus.co.uk/news/23405314.brighton-council-criticised-asking-volunteers-pick-weeds/

Unsafe and 'looking like a dump': How Brighton's controversial eco policy went to seed

The council's decision was well-intentioned – but created a city full of unsafe, overgrown roads and pavements

By Beatrice Fox Leonard
4 September 2023 12:00pm

Some selected thoughts from respondents

• “Glad I’m retiring!”
• We need to change (rotation, strategy, cultivation) – for resistance, lack of alternatives. We cannot just rely on chemistry.
  • Need more targeted application (nozzles, water volumes).
  • "Humans are better at reducing the impact of weed competition but evolution keeps setting the bar higher“.
  • “IWM is the way forward to reduce resistance increasing further. Horticulture/field veg needs to try and reduce the massive spend on hand weeding.”
  • “trends and fads e.g. mintill and regen are not all they are cracked up to be and could be inadvertently more damaging” [than some smoke from straw burning].
• “Politics and pressure groups will lead to further loss of herbicides. Alternatives are cultivation and loss of soil carbon as CO₂ or electric weeding. Neither will be as effective as current herbicides so will be a need to accept more weeds as well as growing more competitive crops where possible. Improved decision making should help results.”
• We need help and investment to make better decisions; based on science not politics.
Priorities for R&D investment

- Non-selective herbicides
- Selective herbicides
- Bioherbicides
- Mowing or cutting
- In-crop cultivation (e.g. ploughing)
- Steam, foam or hot water
- Precision application (e.g. nozzles)
- Burning (flame from external energy source)
- Stubble burning
- Electric weeding
- Decision support & improved decision making
- Bio-control (e.g. biocontrol)
- Remote/automated weed ID
- Automated application, e.g. robots or drones
- Lasers to control weeds
- Crop varieties able to complete effectively with...
- Other
Summary

- Weeds not seen as bad by all & divide opinion.
- 60 years of significant change & challenge.
- Weed science led UK & World; resulted in formation of BCPC (1953); 1964 1st weed review.
  - Herbicides peaked; future challenges will mean greater integration with other measures.
  - Annual & arable weeds still dominate; others (e.g. perennial BLW) are just as important in specific situations.
- Herbicides will remain important with challenges: availability, resistance, authorisation.
- Demand for improved prediction, decision support (of need & impact) & weed detection.
- Targeting & application practice & formulation improvements could help.
- Investment needs: new knowledge and KE.
- BWCC objectives still highly relevant.

BWCC Objectives were:
To promote and encourage science and practice of weed control.
To organise conferences on weed control, to publish and sell or otherwise distribute the reports of the proceedings.
To disseminate information on weed control.
To collaborate with other organisations the objects of which are to encourage the science and practice of crop protection.
To do all other lawful things incidental or conducive to the above objectives.
Thank you
For listening & contributors

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