

Global Herbicide Resistance Action Committee

Global HRAC Member Companies.



HERBICIDE
RESISTANCE
ACTION
COMMITTEE

Our Members:

BASF

Bayer Crop Science

Corteva

FMC

Syngenta Crop Protection

Sumitomo Chemical Company

UPL

Our Staff:

Chair

Rex Liebl - BASF

Secretary/Treasurer

Roland Beffa – Bayer

Communications Lead

Gael Le Goupil, Syngenta



Working Groups:

Auxin	HPPD	Communications weedscienc.org hracglobal.com	Issues Engagement	MOA Classification	PPO
TBD	Roland Beffa	Gael Le Goupil	Harry Streck	Rex Liebl	John Pawlak

Key objectives for Working Groups:

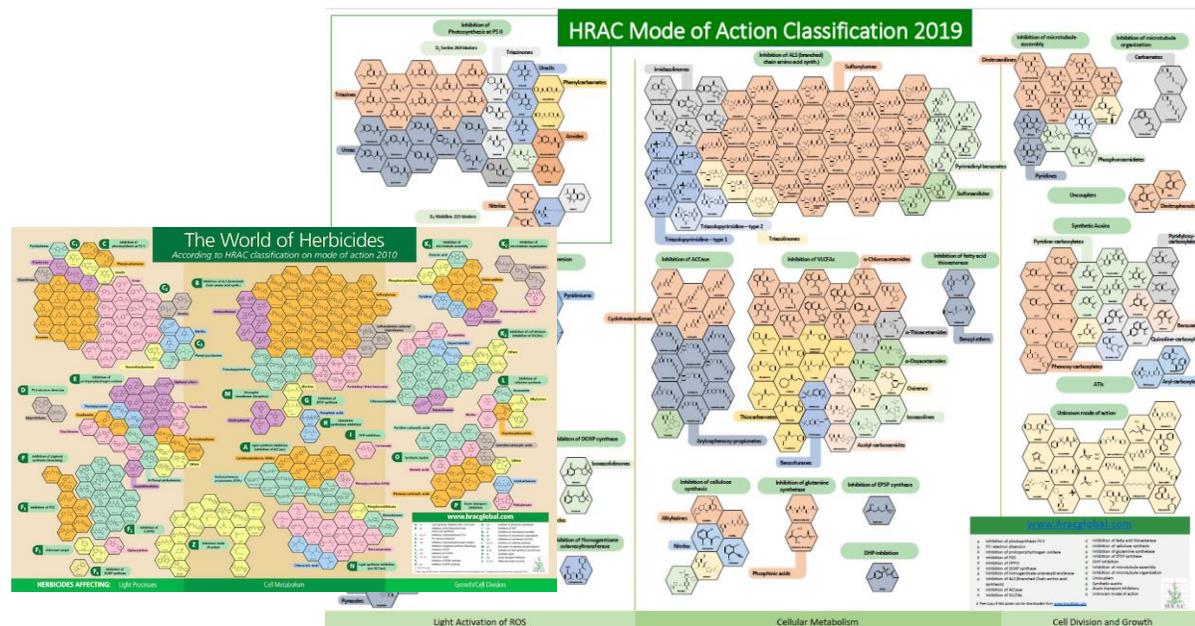
- Consolidate and communicate information for specific MOAs
- Monitor research
- Support intellectual dialogue
- Customize BMPs for a given MOA
- Address specific resistance topics (e.g. Monitoring)

Global HRAC Initiatives and Activities

- Disseminate information on resistant weeds:
 - The International Survey of Herbicide Resistant Weeds
 - HRAC Website
 - Seminars and Symposia
- Build recommendations:
 - Working groups
 - Testing protocols
- Mode of Action Classification:
 - Poster
 - Online tool
 - Coordination with other entities



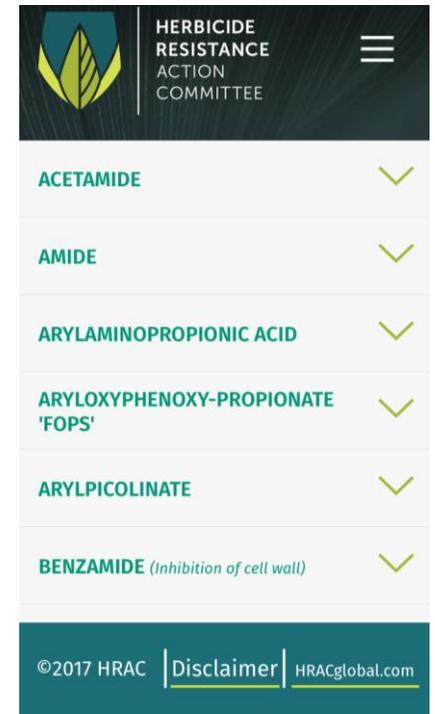
www.weedscience.org



www.hracglobal.com

2019 Accomplishments & 2020 Activities

- Continued engagement with local/regional HRACs
- MOA Classification Working Group – updates and revisions completed
- Herbicide MOA app
- PPO Working Group initiated
- Auxin Working Group sponsored review paper
 - ✓ One of the “top download papers” of the year
- Review of resistance testing methods near completion
- Survey of HRAC stakeholders completed
- Updating to weedscience.org website
- Joined International Weed Genomic Consortium as member and sponsor.



MOA mobile app



Auxin Resistance Review

European Herbicide Resistance Action Committee



European HRAC Member Companies.



Our Members:	Our Staff:
<p>Adama</p> <p>BASF</p> <p>Bayer Crop Science</p> <p>Corteva</p> <p>FMC</p> <p>Gowan</p> <p>Nufarm</p> <p>Syngenta Crop Protection</p> <p>UPL</p>	<p>Chair <i>Marc Bonnet- UPL</i> <i>Géraldine Bailly - UPL</i></p> <p>Secretary/Treasurer <i>Alan Porter – Consultant</i></p>

Working Groups:

Fact Sheet Resistance Matrix	European Website	MOA Classification – European position	Interaction with Country resistance working groups
Géraldine Bailly Marisa Salas Bernd Sievernich Matt Cordingley Marc Bonnet	Géraldine Bailly Eileen Paterson Alan Porter	Géraldine Bailly Marisa Salas Bernd Sievernich Matt Cordingley Marc Bonnet	Marisa Salas Marc Bonnet Xavier Belvaux

European HRAC Initiatives and Activities



- **Fact sheet resistance**
 - Additional definitions on the scientific aspects (modifiers)
 - Focus on the biology of the key weeds
- **Mode of Action Classification**
 - European Feedback provided to Global HRAC
- **European country group communication**
 - Discuss with Country Working Groups what are the expectations from EHRAC

Fact sheet resistance



❑ Propose of the fact sheet:

EHRAC would like to collaborate with key researchers highly knowledgeable on weed biology and herbicide resistance at the European level to built “weed fact sheets” that provide a comprehensive and ready to use information on major weeds on major crops (cereals, Corn, rice,...) in Europe (Turkey included).

EHRAC will publish the weed fact sheets on their website. These fact sheet could be used for posters or scientific communication as appropriated

❑ Objectives

- To present an overview of the biology of a given weed, their agronomic practices, their herbicide resistance status, and the resistance management strategies.
- Information should be concise and to cover a maximum of 2 pages

□ Content of the fact sheet

- The weeds selected are: *Apera spica-venti*, *Bromus sterilis*, *Echinochloa crus-galli* and *Lolium rigidum*
- The fact sheet will included the following information:
 - General overview of the weed biology “identity card”
 - Agronomical importance of the weed in EU
 - weed distribution in Europe
 - importance of the weed in Europe by crop and country (map)
 - How do agronomic practices e.g. soil cultivation, crop sowing date, crop interception, etc. influence the competitiveness, life cycle, seed production of the weed
 - General overview of the resistance cases
 - Reported cases in Europe
 - widespread of the resistance
 - Resistance mechanism TS/NTS, if known
 - Best resistance management practices
 - modes of action currently available to control that weed in Europe?
 - How can those modes of action be best used in an integrated weed control program?
 - insights for non-chemical methods best appropriate to the weed
 - insights for resistance weed control in the crop rotation(s)

“identity card”

criteria	Echinochloa crus-galli
Life cycle and habitat	
Life cycle <i>(annual, biennial, perennial)</i>	annual, spring-annual
Germination window	April - September peaking in May-June
Max generations a year	2 - 3
Occurrence in crop or cultivation system	almost all arable crops sown in spring, notably maize/sunflower, also perennial crops, non-crop and aquatically in rice
Genetics and Propagation	
Ploidy	hexaploid (2n = 54)
Pollination <i>(self/cross/obligate cross)</i>	self-pollinating
pollen dispersal in case of cross-pollination <i>(e.g. wind, animal)</i>	
Seed shattering <i>(before/after harvest)</i>	Seeds are shed as soon as they mature and seeding can occur over extended periods of time
Fecundity <i>(seeds/plt)</i>	2000 - 40,000 depending on agroclimatic conditions
Seed dispersal <i>(e.g. wind)</i>	wind, water, animals/birds (+man)
Distance of seed dispersal	several metres from the parent, except in the case of water movement in rice paddies
Seed viability	high
Dormancy	low-moderate
Seed bank longevity	At least 6 - 8 years
Seed decline per year	~10-20%

☐ Team members

Weeds	EHRAC contact	Company	Scientific expert
<i>Lolium rigidum</i>	Simon Moyal	Nufarm	Maurizio Satin
<i>Bromus sterilis</i>	Eileen Paterson	Corteva	Sarah Cook Lyn Tatnell
<i>Apera spica venti</i>	Bernd Sievernich	BASF	Jan Peterson
<i>Echinochloa crus galli</i>	Marisa Salas	Corteva	Jose-Maria Montull

☐ Milestones

1. Word document template will be provided at the end of September 2020 by EHRAC
2. First draft send back to EHRAC by end January 2021
3. EHRAC review and feedback to scientist by March
4. Weed Fact Sheets format harmonization and publication on EHRAC website by June 2021

Herbicide Resistance Working Group - Survey



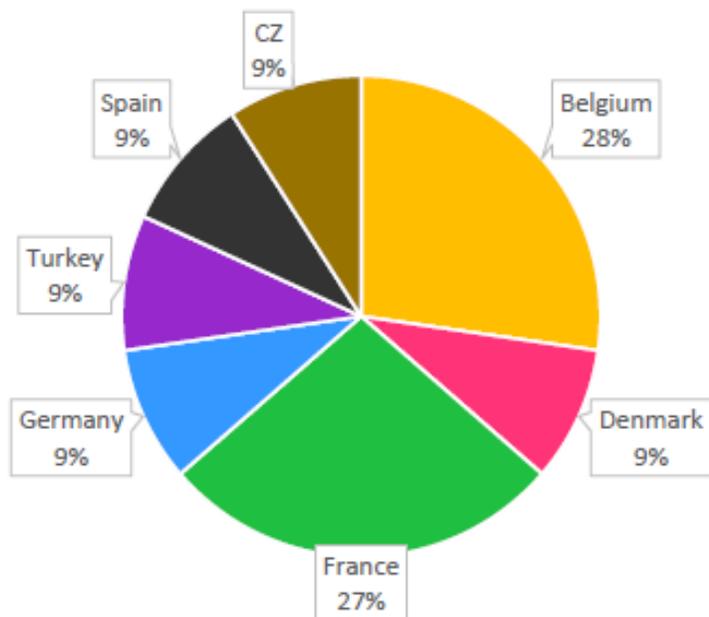
Herbicide Resistance Working Group - Survey

Need identified in 2019 for eHRAC to (re)-connect with Herbicide Resistance Country groups to:

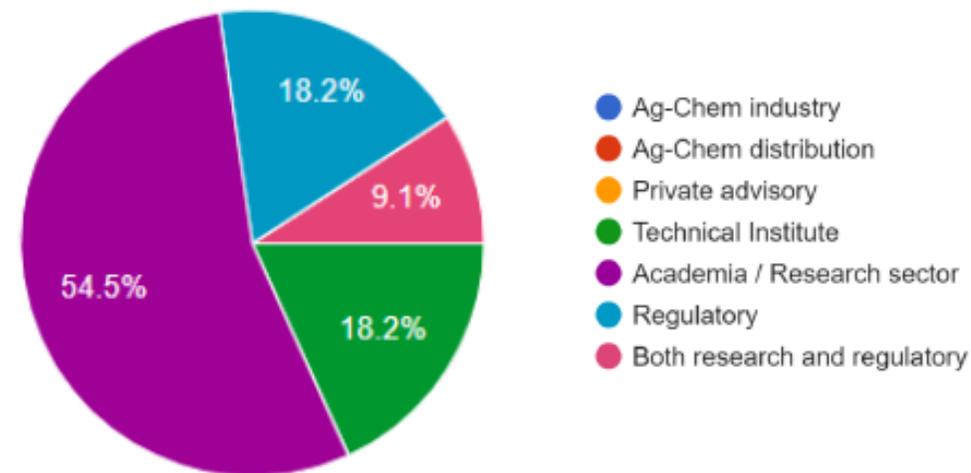
- i) introduce what is the role of the eHRAC,
- ii) learn about the structure and actions of the ongoing national working groups
- iii) determine how both organisations could improve the communication and develop effective long-term collaboration.

Herbicide Resistance Working Group - Survey

Survey was sent to 19 people. Up today we have received 11 answers



Country



Type of organisation

Herbicide Resistance Working Group - Survey



Country (responses)	Existing Resistance working group	Comments
Turkey (1)	No	<ul style="list-style-type: none"> • Interested to create a resistance WG. • eHRAC is expected to be an active group, not only online. • eHRAC to develop strategies and control programs to be useful for EU farmers. • Financial support from eHRAC is expected for setting up a working group in Turkey as well as eHRAC help to connect with a group if one is created
CZ (1)	No	<ul style="list-style-type: none"> • Interested to create a resistance WG. • Expectations from eHRAC and GHRAC : would expect more collaborations with experienced researchers, so that we all together can solve the problem of highly evolving resistance, before it gets well-established. • Financial support from eHRAC is expected for setting up a working group in CZ as well as eHRAC help to connect with a group if one is created
ES (1)	Yes, CPRH	<ul style="list-style-type: none"> • Group is composed of ag-chem companies, academia members, national regulation bodies and technical institutes • Target audience of the group is ag-chem industry and national regulation bodies • The group is funded by subscriptions from private sector, about 1,000€/year • eHRAC is expected to provide more info about their activities and how to improve them

Herbicide Resistance Working Group - Survey



Country (responses)	Existing Resistance working group	Comments
Belgium (3)	No	<ul style="list-style-type: none"> • CRA Wallonie .are interested to create a Herbicide Resistance Working Group in their country for educational purposes and sharing knowledge to farmers, Ag-Chem industry, National Regulation bodies. • Financial support form eHRAC is expecting for: National group set up, Resistance monitoring, Projects development, Meetings organization • Authorities is not interested to create a group
France (3)	Yes, COLUMA	<ul style="list-style-type: none"> • Not directly working on herbicide resistance, more on insecticide resistance.
Denmark (1)	Yes, NORBARAG	<ul style="list-style-type: none"> • eHRAC should participate to the funding • eHRAC should help them to connect to other national country groups • Other expectations from the country groups towards eHRAC and Global HRAC
Germany (1)	Yes, Expert Group lead by the JKI (Prof. Peter Zwerger)	<ul style="list-style-type: none"> 1) Have a global view on herbicide resistance and management 2) Facilitation and maintenance of the herbicide resistance database 3) Facilitation a smooth transition to the new HRAC/WSSA classification by providing information to regulatory and advisory bodies. 4) Data dissemination 5) Organize workshops/ conferences 6) Initiate WG's with specific topics.

Thank You!

Contact us at hracglobal.com