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BROMUS SECALINUS L. (RYE BROME) – AN UNWANTED WEED IN THE WINTER WHEAT CROPS

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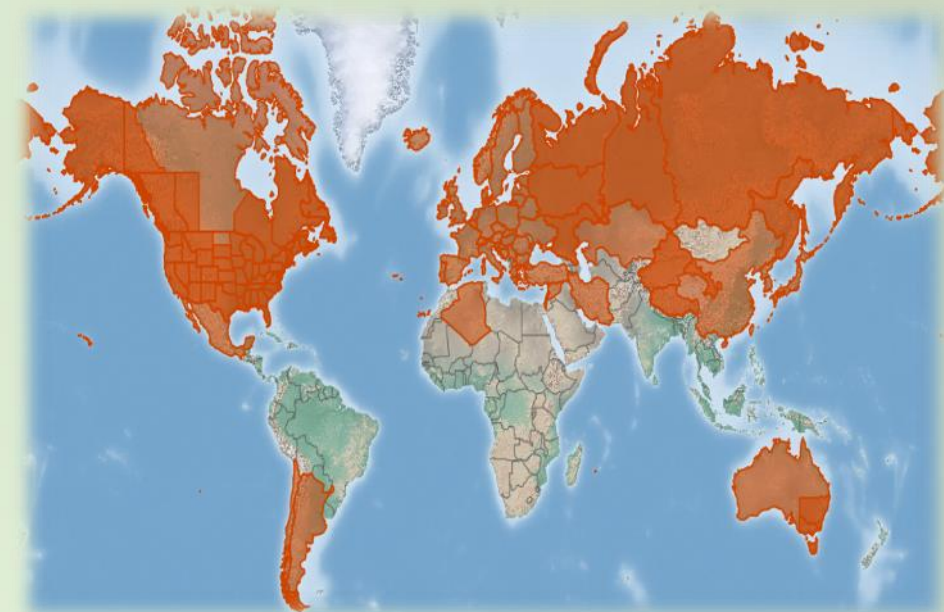
Abstract: The species *Bromus secalinus* L. (rye broom) is a dangerous, hibernating annual grass weed that infests rye (*Secale cereale*), winter wheat (*Triticum aestivum*) and other cereal crops. The present study aims to identify chemical variants for controlling the species *Bromus secalinus* L. in winter wheat crops, by using a diversified range of post-emergent herbicides, approved for this crop. Research on the chemical control of the species *Bromus secalinus* (rye broom) was carried out during 2022 and 2023, in an experimental field located in the locality of Peciu Nou, Timiș County. The variants (5 + 1 untreated control variant), each in 4 repetitions, were represented by 5 herbicides approved in Romania for the control of monocotyledonous weeds in wheat crops, at the time of the research.

• Introduction

The high prevalence of cereal crops in Romanian agriculture and the repeated use of similar herbicides, especially anti-dicotyledonous ones, have led to a shift in weed species composition, with monocotyledonous weeds becoming dominant. Among them, *Bromus secalinus* (rye brome) has emerged as a particularly problematic species in straw cereal crops due to its competitive growth, resistance to control measures, and negative impact on crop yield and quality. Native to Eurasia, this winter annual weed spreads easily across various habitats and mimics the life cycle of cereal crops, making it a major contaminant at harvest. Each plant can produce up to 1,400 seeds, which germinate in autumn and contribute to a persistent soil seed bank.

Infestations reduce grain quality, making flour unusable and potentially harmful to human and animal health. Effective control requires an integrated approach, including timely tillage, crop rotation, seed cleaning, delayed sowing, and the use of herbicides with diverse modes of action to prevent resistance. Cases of herbicide-resistant *B. secalinus* have already been reported. Additionally, natural alternatives such as essential oils from *Heracleum sosnowskyi* show potential for sustainable management.

Distribution of the species *Bromus secalinus* L. around the world



• Material and method

Field trials were conducted in 2023–2024 in Peciu Nou, Timiș County, to evaluate five herbicides (plus a control) for the chemical control of *Bromus secalinus* in winter wheat. Treatments were applied post emergence in spring, during the wheat tillering stage and *B. secalinus* 2–4 leaf stage. Herbicides were used at recommended doses, with four replicates per variant.

Weed infestation was assessed before and 15 days after treatment using five 0.25 m² frame counts per plot. Data were used to calculate weed density, species constancy (k%), and participation (p%) based on standard phytosociological methods.

Initial weed mapping (mapping sheet) in winter wheat crop (average values 2023/2024)

| Nr. Crt. | Species | Phenophase/ Waist | Amount 5/survey (S) | Average (bur./m ²) | P (%) | k (%) | Class/ Lifetime |
|----------|-------------------------------------|----------------------|---------------------------|-----------------------------------|----------|----------|--------------------|
| 1 | <i>Bromus secalinus</i> (BROSE) | A 8 | 169 | 33.8 | 24.3 | 100 | M.a. |
| 2 | <i>Fallopia convolvulus</i> (FALCO) | A 3 | 82 | 16.4 | 11.7 | 100 | D.a. |
| 3 | <i>Stellaria media</i> (STEMA) | B 4 | 73 | 14.6 | 10.5 | 100 | D.a. |
| 4 | <i>Veronica arvensis</i> (VERAR) | B 5 | 59 | 11.8 | 8.6 | 100 | D.a. |
| 5 | <i>Galeopsis tetrahit</i> (GALTE) | A 9 | 55 | 11.2 | 8.1 | 100 | D.a. |
| 6 | <i>Galium aparine</i> (GALAP) | A 8 | 48 | 9.6 | 6.9 | 100 | D.a. |
| 7 | <i>Avena fatua</i> (AVEFA) | A 9 | 43 | 8.6 | 6.2 | 80 | M.a. |
| 8 | <i>Polygonum aviculare</i> (POLAV) | A 4 | 41 | 8.2 | 6.0 | 100 | D.a. |
| 9 | <i>Fumaria officinalis</i> (FUMOF) | A 3 | 36 | 7.2 | 5.1 | 60 | D.a. |
| 10 | <i>Papaver dubium</i> (PAPDU) | A/B 11 | 31 | 6.2 | 4.3 | 80 | D.a. |
| 11 | <i>Elymus repens</i> (ELYRE) | A 8 | 23 | 4.6 | 2.5 | 40 | M.p. |
| 12 | <i>Convolvulus arvensis</i> (CONAR) | A 4 | 12 | 2.4 | 1.8 | 80 | D.p. |
| 13 | <i>Cirsium arvense</i> (CIRAR) | A 11 | 8 | 2.2 | 1.7 | 60 | D.p. |
| 14 | <i>Consolida regalis</i> (CONRE) | A 4 | 12 | 2.0 | 1.5 | 40 | D.a. |
| 15 | <i>Rubus caesius</i> (RUBCA) | A 8 | 9 | 1.2 | 0.8 | 40 | D.p. |
| Total | | - | 695 | 139 | 100,0 | - | - |

• Results and discussions

The initial weed assessment in the winter wheat crop during the 2023–2024 period revealed significant weed pressure, with an average density of 139 weeds/m². A total of 15 segetal species were identified, among which *Bromus secalinus* L. (rye brome) represented a substantial 24.3% of the total (33.8 plants/m²), uniformly distributed across the experimental area. Annual dicotyledonous species were dominant, contributing to over 62% of the weed flora, while perennial dicots and monocots such as *Avena fatua* and *Elymus repens* were less frequent.

Herbicide efficacy varied significantly among the tested products. **Senior (piroxsulam + cloquintocet-methyl + Dasoil)** achieved the best overall control, eliminating 98.1% of *Bromus secalinus* and providing broad-spectrum efficacy against dicotyledonous weeds, resulting in the cleanest plots (85.9% total weed reduction). **Atlantis Flex WG** also performed well against *Bromus secalinus* (92.5%) but was less effective on broadleaf weeds, leading to lower overall weed control (35.9%). **Axial One EC** reduced general weediness by 61.2% but did not control *Bromus secalinus*, while **Hussar Activ Plus OD** achieved good control of many weed species (81.7%) but had no effect on the target species. **Herbos 110 EC**, although intended for grass control, showed the least efficacy, failing to manage *Bromus secalinus* and achieving only 21.6% weed control.

The efficiency of graminicidal herbicides used in winter wheat crop (average values 2023/2024)

| Herbicide variant/dose | Composition (a.s.) | Herbicide effectiveness (%) | |
|--|--|-----------------------------|----------------------------|
| | | General | <i>Bromus secalinus</i> L. |
| V ₁ – control (unherbicide) | - | 0.0 | 0.0 |
| V ₂ – Atlantis Flex WG (0.3 kg/ha) | mesosulfuron-metil 45 g/kg + propoxycarbazon-sodiu 67.5 g/kg + mefenpir-dietil 90 g/kg | 35.9 | 92.5 |
| V ₃ – Axial One 050 EC (1 l/ha) | pinoxaden 45 g/l + florasulam 5 g/l + cloquintocet-metil 11.25 g/l | 61.2 | 0 |
| V ₄ – Herbos 110 EC (0.7 l/ha) | fenoxaprop-P-etil 110 g/l | 21.6 | 0 |
| V ₅ – Hussar Activ Plus OD (1 l/ha) | (1 iodosulfuron-metil-Na 10 g/l + 2.4 D (2-etilhexil ester) 300 g/l + tiencarbazon-metil 7.5 g/l, mefenpir dietil 30 g/l | 81.7 | 0 |
| V ₆ – Senior (0.25 kg/ha) | piroxsulam 7.5 % + cloquintocet-metil (adjuvant) 7.5 % 250 g/ha + 1 l/ha Dasoil (adjuvant) | 85.9 | 98.1 |

Yield data closely correlated with herbicide effectiveness. The highest average wheat yield (6628 kg/ha) was recorded in the **Senior-treated plots (V6)**, followed by **Hussar Activ Plus (V5)** and **Axial One (V3)**, which increased yields significantly but to a lesser extent. The **Atlantis Flex (V2)** variant produced moderate yields (4607 kg/ha), while **Herbos 110 EC (V4)** had the lowest yield among treated variants (4324 kg/ha), due to poor weed control. The **non-treated control plot (V1)** yielded the least (3983 kg/ha).

Production obtained from winter wheat crop (average values 2023/2024)

| Herbicide (variant) | Dose | Absolute production (kg/ha) | Relative production (%) | Production difference (kg/ha) | Signifi. dif. |
|--|------------|-----------------------------|-------------------------|-------------------------------|---------------|
| V ₆ – Senior | 0.25 kg/ha | 6628 | 125.4 | + 1340.2 | XXX |
| V ₅ – Hussar Activ Plus OD | 1 l/ha | 6349 | 120.1 | + 1340.2 | XXX |
| V ₃ – Axial One 050 EC | 1 l/ha | 5836 | 110.4 | + 548.2 | X |
| Average | - | 5287.8 | 100,0 | 0,00 | Mt. |
| V ₂ – Atlantis Flex WG | 0.3 kg/ha | 4607 | 87.1 | - 680.8 | 00 |
| V ₄ – Herbos 110 EC | 0.7 l/ha | 4324 | 81.8 | - 963.8 | 000 |
| V ₁ – control (unherbicide) | - | 3983 | 75.3 | - 1304.8 | 000 |

DL_{5%} = 498 kg/ha DL_{1%} = 659 kg/ha DL_{0.1%} = 827 kg/ha

The study highlights that effective control of *Bromus secalinus* and other weeds requires careful herbicide selection based on weed flora composition. Best results were obtained with products combining broad-spectrum activity and high efficacy against rye brome. Furthermore, integrated weed management—including proper herbicide use, crop rotation, and timely field operations—is recommended for sustainable weed control and yield optimization in wheat crops.

- **Conclusions: Emerging Threat of *Bromus secalinus* in Cereal Crops.** *Bromus secalinus* (rye brome) has transitioned from a ruderal to a significant segetal weed in the past 5–6 years, becoming a growing threat in cereal fields. Its increasing prevalence—constituting 24.3% of observed weed density (33.8 plants/m²)—is linked to herbicide strategies focused mainly on broadleaf weeds.
- **Effective Weed Management Requires Integrated and Targeted Approaches.** Among the five tested graminicides, only Atlantis Flex WG and Senior (with adjuvant Dasoil) effectively controlled *Bromus secalinus*, nearly eliminating it. For sustainable, long-term management, an integrated weed control strategy is essential. This should include the combined use of herbicides with complementary spectra, accurate weed mapping to inform herbicide choice, rational crop rotation, timely soil and harvesting operations, and the use of clean, weed-free seed.