Weed Fact Sheet
Lolium species

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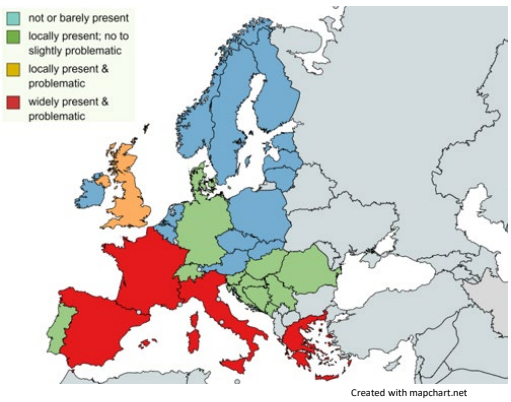
Lolium species are problematic weeds in most central, western and southern EU countries.

Lolium rigidum is predominant in southern regions whereas *Lolium multiflorum* is prevalent in the north. In most of central Europe the two species coexist. *Lolium spp.* commonly infest small grain cereals and other autumn and early spring sown crops, but also perennial crops such as orchards, vineyards and alfalfa.



Weed Biology

EPPO-codes (*latin*/common name)	LOLRI (*Lolium rigidum*, rigid ryegrass) LOLMU *(Lolium multiflorum*, Italian ryegrass) LOLPE (*Lolium perenne*, perennial ryegrass)
Life cycle	Annual (perennial for LOLPE)
Germination window	From autumn to early spring
Max. generation/year	1
Occurence in crop or cultivation system	Occurrence in crops sown in autumn-early spring, orchards, vineyards, alfalfa
Yield loss	Crop yield loss can be as high as 50-60% and it varies greatly according to *Lolium* density, crop species and variety as well as pedo-climatic conditions
Preferred environmental conditions	present in most soil~~s~~ and weather conditions

Ploidy	Diploid (2n=14)
Pollination	Obligate cross-pollinating, thus highly genetically variable & readily forms intrageneric hybrids
Pollen dispersal	By wind
Seed shattering	Mostly after harvest
Fecundity *(seeds/plant)*	From a few hundreds to a few thousands according to the no. of tillers
Seed dispersal	By wind
Distance of seed dispersal	10 to 20m
Dormancy	Low (with high germination rate)
Seed bank longevity	Short (< 18-24 months)
Seed decline per year	~70% (2-4% of viable seeds after 3 years)

Impact of Agronomic Measures on Occurrence and Spread

Soil cultivation

- With a short seed bank longevity and a low dormancy, ploughing after the harvest and no more soil inversion for the next 3 years is an efficient way to lower infestation, and even better if followed by a stale seedbed preparation

Crop sowing date

- Emergence of Lolium is more impacted by sufficient soil moisture than the date of sowing
- Good early season soil moisture favours Lolium emergence supporting delayed cereal sowing for lower in-crop densities

Crop rotation and competitiveness

- Crop rotation with alternation of winter and summer crops, competitive crop varieties and any measure which favour a good crop establishment are useful control tools

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Observed Resistance in Europe

- Herbicide resistance to ACCase- and ALS-Inhibitors is widespread in central and southern Europe, especially in France, UK, Spain, Italy, Greece, and Turkey
- Resistance to glyphosate is documented in France, Switzerland, Italy, Spain, Greece and Portugal
- *Lolium* spp. are very prone to evolve cross- and multi-resistance to herbicides commonly used for their control
- Cross-resistance among ACCase-Inhibitors is common
- Multiple resistance between ACCase and ALS is substantially increasing. Multiple resistance between ACCase-, ALS- and EPSPS-Inhibitors is also documented in central Italy

Mode of Action	HRAC	Resistance level
ACCase	1 (A)	+++
ALS	2 (B)	+++
EPSPS	9 (G)	++
PSII	5 (C2)	+
VLCFA	15 (K3)	+

+ = low
++ = medium
+++ = high

Target-site resistance (TSR)

- ACCase- and ALS-inhibiting herbicides are the most affected in annual crops, followed by EPSPS-inhibitors (i.e. glyphosate) in perennial crops
- The most frequent TSR-mutation for ACCase in *Lolium* spp. are Ile1781, Ile2041 and Asp2078; whereas for ALS are Pro197 and Trp574
- For glyphosate there are reports of a mutation (Pro106) in the EPSPS gene that can contribute to the resistance status

Non Target-Site Resistance (NTSR)

- Metabolic resistance evolves rapidly in *Lolium spp.* especially at low or suboptimal doses and this is an important point to consider for weed management
- There are evidences that TSR is more frequent in southern Europe whereas NTSR is more frequent in northern part of the continent
- Vacuolar sequestration appears to be the main glyphosate resistance mechanism

Best Management Practices

- To prevent and mitigate resistance development, follow the Guideline to the Management of Herbicide Resistance published by GHRAC
- Rotate herbicides from different modes of action effective on the same target weed throughout the crop rotation
- Integrate sequential application of soil residual and post-emergence herbicides to reduce selection pressure by post-emergence herbicides
- Use mixture of products with different modes of action if the related active substances give high levels of control on the targeted weed
- Monitor results of herbicide applications to allow a timely adjustment of weed control strategies when necessary
- Integrate non-chemical methods such as:
  - Alternate non-inversion tillage with ploughing every 3-4 years to reduce viable seeds in the seed bank
  - Intensify rotation of winter and spring/summer crops
  - Increase competitiveness esp. of cereal crops by using higher seeding rates
  - Where feasible, prepare stale seedbed to foster early germination allowing mechanical or chemical control before sowing of crop

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