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ANTI-GERMINAL EFFECT OF AN INFRARED TREATMENT ON THE SEEDS OF RAGWEED (AMBROSIA ARTEMISIIFOLIA L.) IN CONTROLLED CONDITIONS : FEASIBILITY STUDY

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In a previous study, we determined a protocol to destroy ragweed by thermal shock: exposure to infrared heat radiation (4 seconds).

Before IR treatment

After 4 s IR treatment

1 day after IR treatment

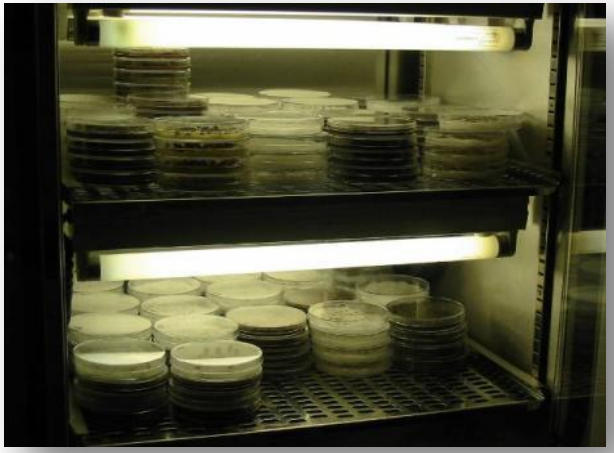
The objective of our work is to check the ragweed seeds sensitivity to this infrared heat radiation.

IR emitter

Ragweed seeds

IR oven

Germination chamber



Methodology* :

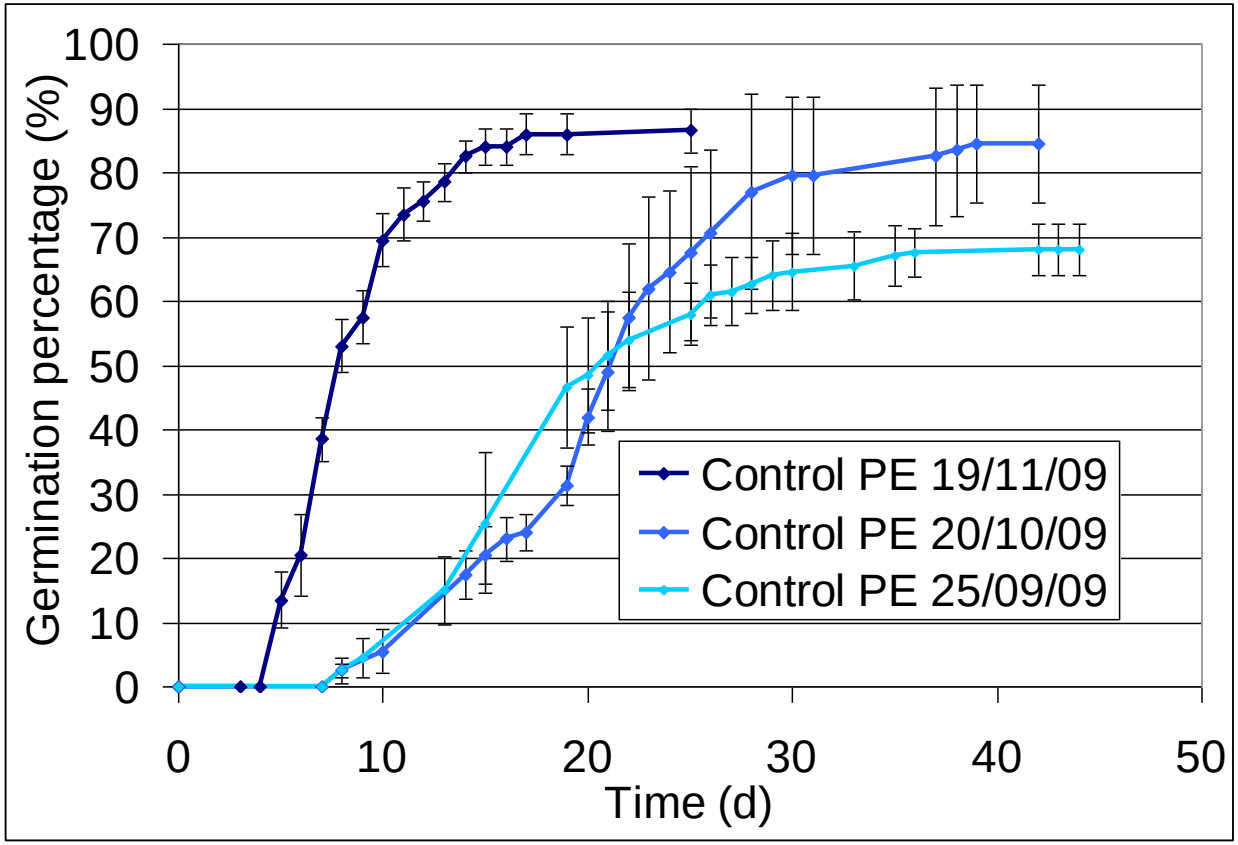
These tests were led in controlled conditions (IR oven) on seeds collected in 2009 and 2010 on two different locations: Pont-Evèque and Luzinay (Isère, France).

The infrared radiation times were 4, 8 or 12 seconds on seeds collected at different dates (from September till November).

Infrared treatments were applied immediately after the collection.

After 4 weeks in the cold and wet atmosphere to raise the dormancy, seeds were placed in the optimal conditions (23 °C – 15 h / 15°C – 11 h) for the germination during 30-40 days.

*The detailed experimental protocol was described in an article published in the review Phytoma (No. 648-November 2011)

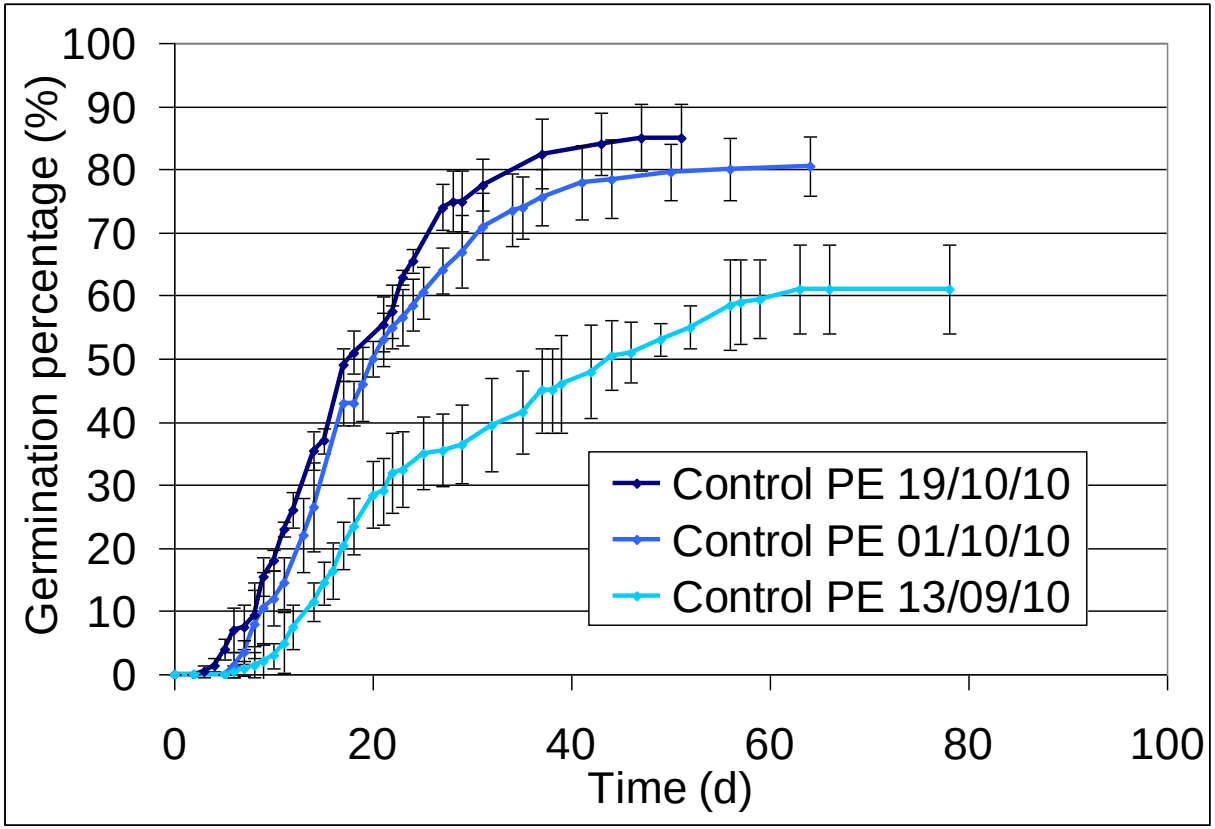


RESULTS

2009

<u>Controls groups (collected in 2009 on the location A)</u>:

- 3 groups collected in September, October and November 2009
- Seeds collected in September: 68% germination in 30 days
- Seeds collected in October: 85% germination in 15 days
- The kinetics of germination and germination capacity increase with ripening seeds



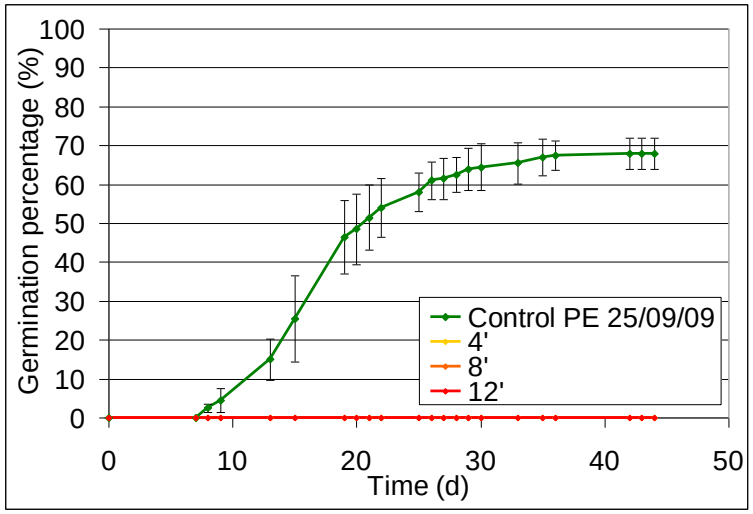
RESULTS

2010

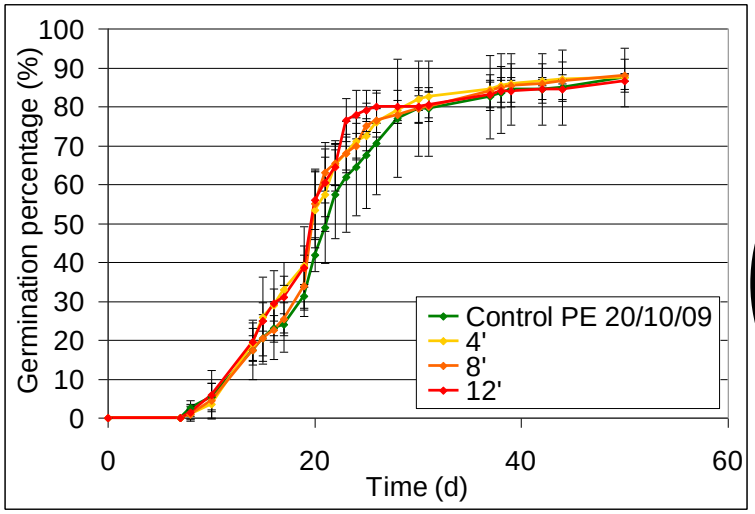
<u>Controls groups (collected in 2010 on the location A)</u>:

- Seeds collected in September: 61% germination in 30 days
- Seeds collected in October: 85% germination in 20/36 days
- Confirmation of Previous Results (2009) ➔ The kinetics of germination and germination capacity increase with ripening seeds

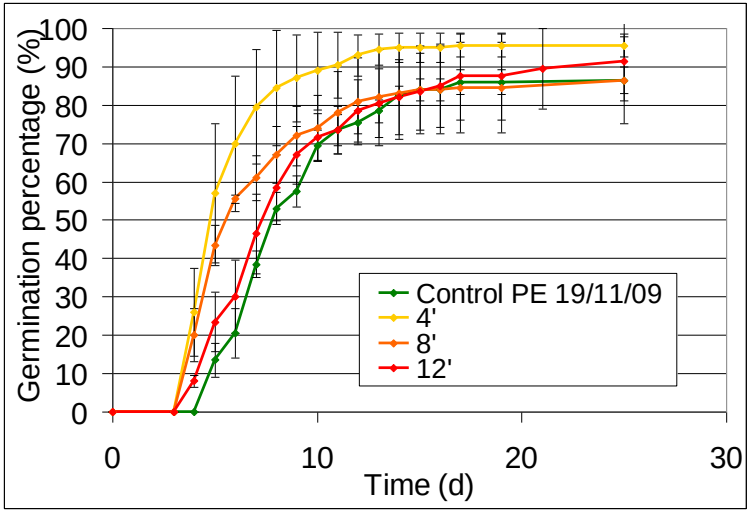
<u>We obtained the same results on three other locations</u>



Groups collected in September



Groups collected in October

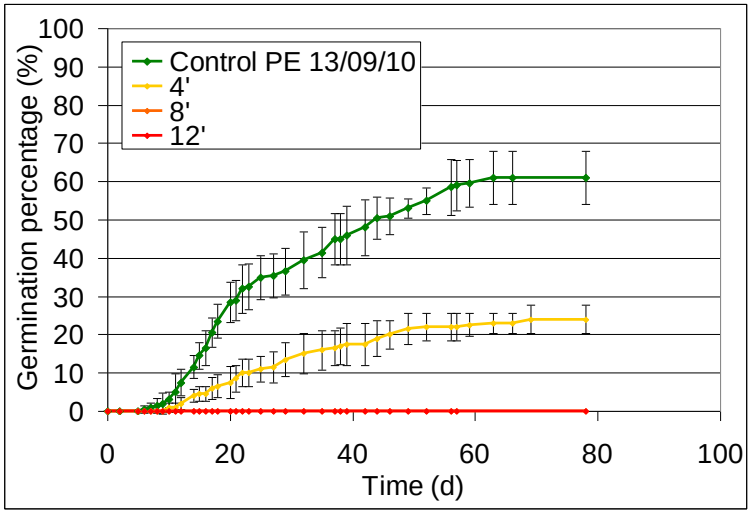


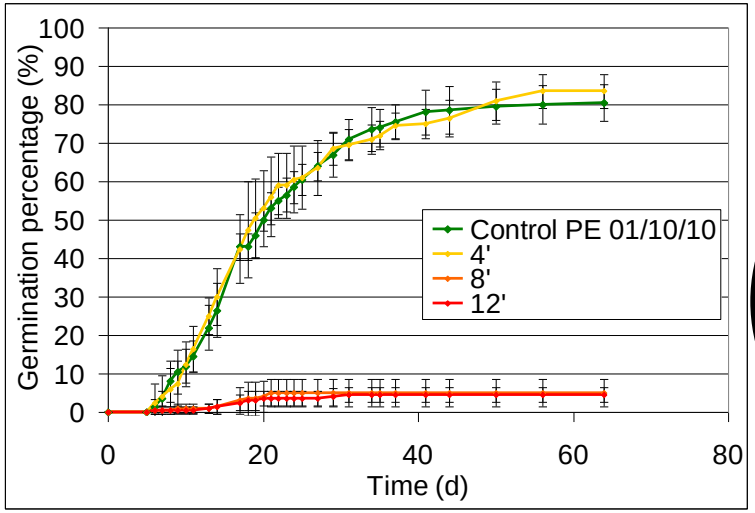
Groups collected in November

Groups collected in 2009 (Site A) + Infrared thermal treatment

- September's groups : the infrared heat treatment during a short time (4") inhibits totally the germination of seeds collected

- October's and November's groups: The long-time IR treatments have no more impact on the germination of the seeds collected in October and November. There is no difference with the control group.





RESULTS

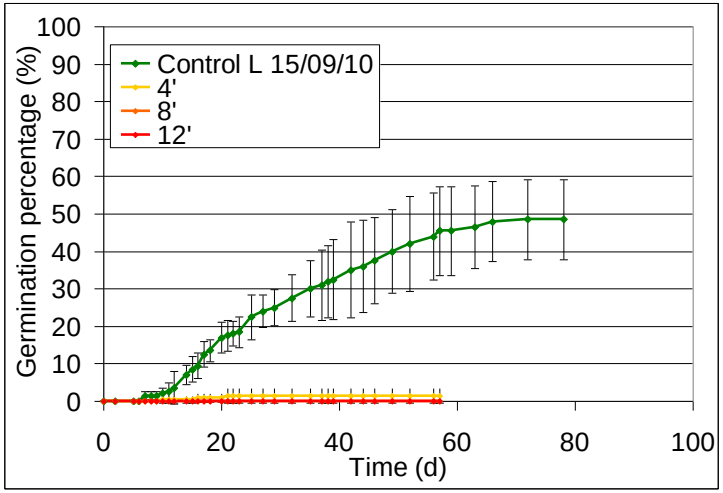
2010

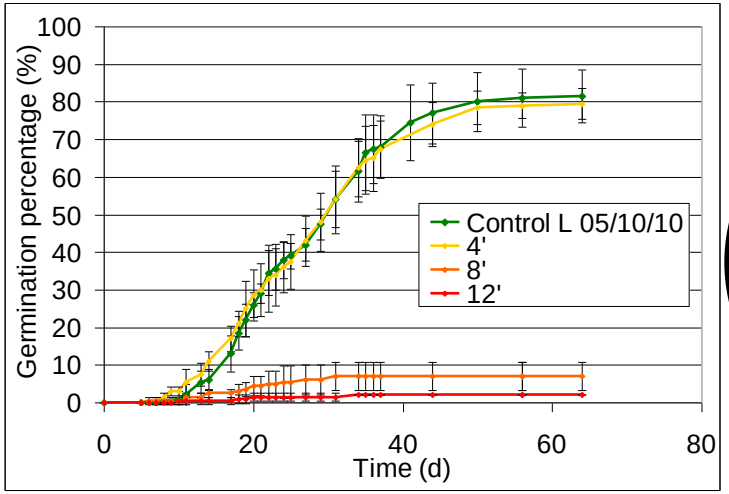
Groups collected in September **Groups collected in October)**

Groups collected in 2010 (Site A) + Infrared thermal treatment

September's groups : the infrared heat treatment during a sufficient time (8-12") inhibits totally the germination of seeds collected. For a short radiation time (4"), the IR efficiency is low: the germination capacity is only 25%.

October's groups :
No impact of short time IR treatment (4") on the germination (germination close to the control group).
For a long time IR treatment (8-12"), the germination is very limited (5%)





RESULTS

2010

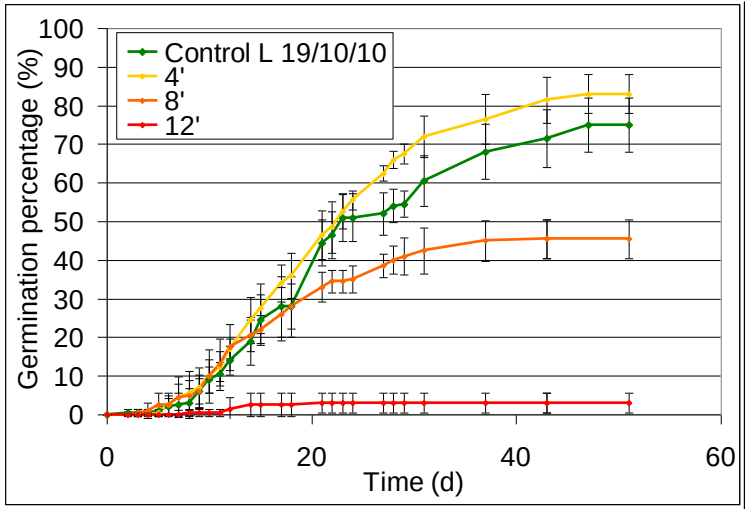
Groups collected in September

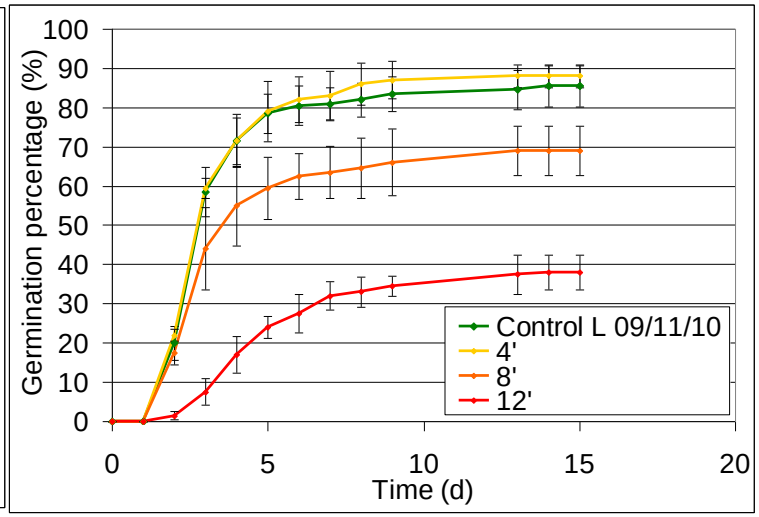
Groups collected in October (Beginning)

Groups collected in 2010 (Site B) + Infrared thermal treatment

September's groups : Whatever the time of infrared radiation, the seeds lose their ability to germinate.

October's groups (beginning): For 8 and 12 seconds of IR radiation, the seeds lose their ability to germinate. Seeds exposed to infrared radiation for 4 seconds have the same kinetics of germination than the control group: NO EFFECT OF IR RADIATION.





RESULTS

2010

Groups collected in October(end) **Groups collected in November**

Groups collected in 2010 (Site B) + Infrared thermal treatment

October's groups (end):
8 seconds of IR radiation has a low impact on germination. The germination is equivalent to half the germination of the control group.
12 seconds of IR radiation limits the ability to germinate at 5%.

November's groups:
The impact of an IR radiation time of 8" is lower (germination ability: 80% of the control group).
The impact of an IR radiation time of 12" also decreases: the seeds can germinate at almost 40% (50% of the control group capacity).

CONCLUSION

The exposure of ragweed seeds to an IR thermal radiation can have an extremely important effect on the germination.

The results show that the infrared heat treatment during a short time (4’’) inhibits totally the germination of seeds collected at the end of summer and beginning of autumn.

The impact of the IR treatment decreases gradually for the seeds collected later, probably in connection with the maturity stage of seeds.

The long-time IR treatments (8-12’’) have no more impact on the germination of the last collected seeds.

CONCLUSION

Other tests must be led *in situ* to check the operational feasibility of the infrared treatment at the end of summer and beginning of autumn.

If this method is confirmed, it will complete the existing methodologies which are applied during the year in a multiannual plan of ragweed fight:

- ➔ Thermal Shock on seedlings early in the season,
- ➔ Grubbing,
- ➔ Mowing,
- ➔ Vegetation late in the season.

ACKNOWLEDGMENT

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