TILLAGE, A EFFICIENT LEVER TO LIMIT ERGOT IN CEREALS

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Ergot of cereals (Claviceps purpurea) is conserved in the soil as sclerotia. After vernalization, these conservation bodies are able to germinate in the spring and to produce stroma, sorts of head with perithecia supported by a stalk. Buried deep these sclerotia are able to germinate, but fail to emerge and to release ascospores in the air. This work attempts to describe the depth distribution of sclerotia, artificially dispersed on the soil surface, under the influence of different tillage systems over a two year sequence.

MATERIEL & METHODS

A three replicate trial (plots 4 m x 28 m) is implemented from July 2012 to April 2013 to follow the become of sclerotia fallen to the ground after passage of two kinds of soil tillage.

Sclerotia are coloured and dispersed on the ground with a pneumatic fertilizer spreader DPS 12, 12 meters wide at 300 sclerotia per m². Three methods are studied combining the plow (depth of work: 20 cm) and a tine cultivator Lemken Smaragd 9 to 4 m wide (depth of work: 10 cm) (Table I).

The observations of burial depth sclerotia are made by successive stripping. The areas studied are of 0.5 m x 0.5 m repeated 4 times / block x 3 replicates. Four soil layers are taken for plowing (0-5; 5-10; 10-15; 15-20) and 2 layers for shallow cultivation (0-5, 5-10). For each sampling, sclerotia are separated manually.

Table I : Différent tillage systems studied

Modality	Campaign 2012/2013 (12th july 2013)	Campaign 2013/2014 (09th october 2013)
L-L	Plowing-rotary harrow	Plowing-rotary harrow
L-WS	Plowing-rotary harrow	Shallow cultivation-rotary harrow
WS-L	Shallow cultivation-rotary harrow	Plowing-rotary harrow

RESULTS

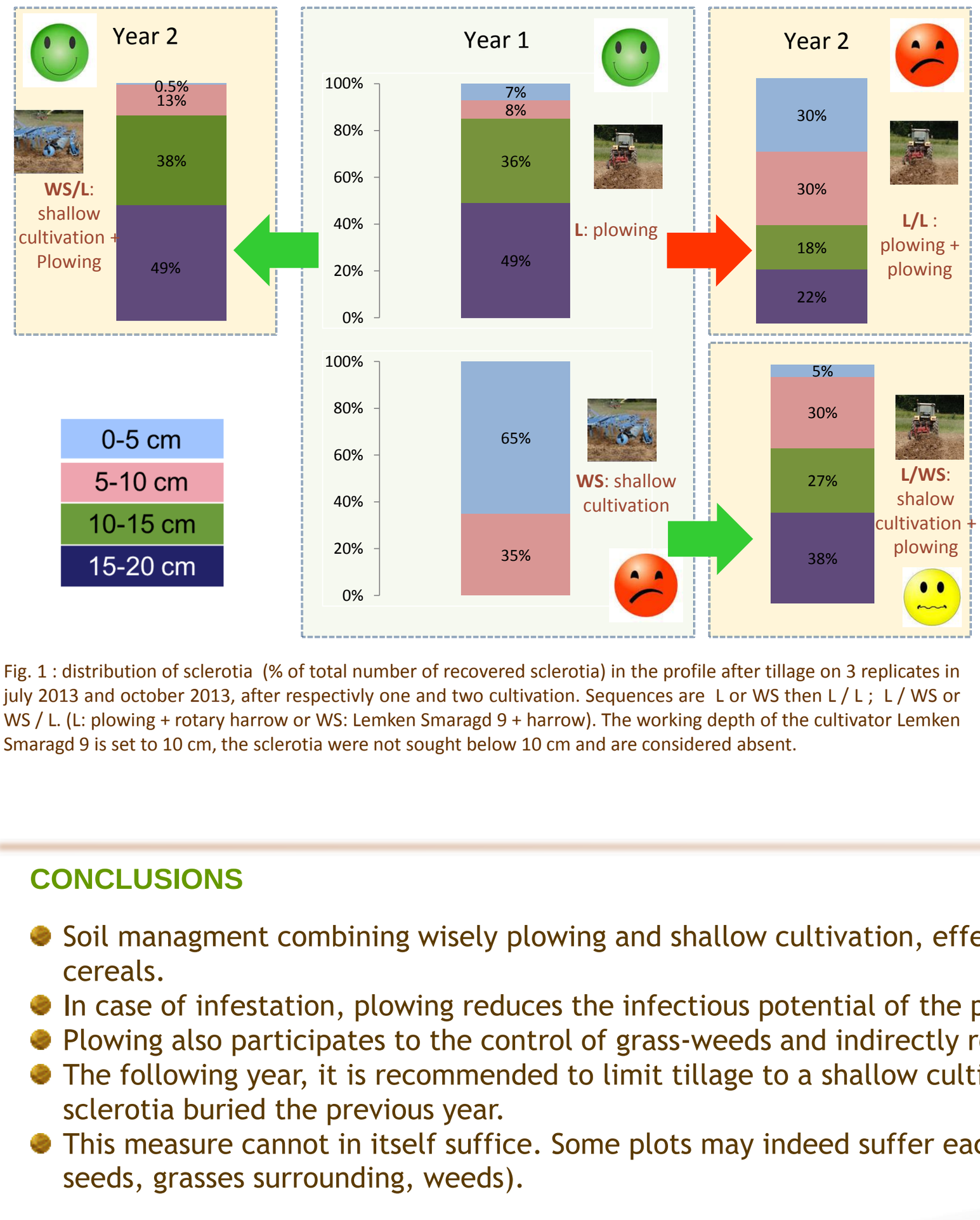

Fig. 1 : distribution of sclerotia (% of total number of recovered sclerotia) in the profile after tillage on 3 replicates in july 2013 and october 2013, after respectivly one and two cultivation. Sequences are L or WS then L / L ; L / WS or WS / L. (L: plowing + rotary harrow or WS: Lemken Smaragd 9 + harrow). The working depth of the cultivator Lemken Smaragd 9 is set to 10 cm, the sclerotia were not sought below 10 cm and are considered absent.

- Ploughing lowers the number of sclerotia in the layers 5-10 cm and 0-5 cm. Nearly 85% of the sclerotia are found below 10 cm.
- Conversely the shallow cultivation helps to keep the majority of sclerotia (65%) in the 0-5 cm layer.
- Double plowing resulted in a relatively homogeneous distribution of the sclerotia on the 4 observed layers. It brings back to surface (0-10 cm) up to 60% of recovered sclerotia.
- One plowing led to concentrate sclerotia in depth below 10 cm. The effectiveness (burying more than 10 cm) after two years is respectively to the sequences L / WS and WS / L of 81% and 64%.
- In both cases, less than 10% of sclerotia found in the layer 0-5 cm are observed.

CONCLUSIONS

- Soil managment combining wisely plowing and shallow cultivation, effectively participates to control of ergot in cereals.
- In case of infestation, plowing reduces the infectious potential of the plot (approximately 85%).
- Plowing also participates to the control of grass-weeds and indirectly reduces the risk of contamination with ergot.
- The following year, it is recommended to limit tillage to a shallow cultivation to avoid exhume to the surface sclerotia buried the previous year.
- This measure cannot in itself suffice. Some plots may indeed suffer each year of exogenous inputs (ascospores, seeds, grasses surrounding, weeds).

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