

COMPARISON OF THE DISTURBED LITTER FLAMMABILITY ON CALCAREOUS SOILS AND ACIDIC SOILS IN SOUTHERN FRANCE

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CONTEXT & OBJECTIVES

Describing fuel characteristics on Mediterranean vegetation in the framework of the European programme Fire Paradox

=> Assessing litter flammability on calcareous and acidic soils

METHODOLOGY

Sampling of disturbed litter

Fire regimes => ≠ litter thicknesses and ≠ stand heights



x 10

Sample burning



Flammability parameters

- Time-to-ignition
- Flaming duration
- Rate of spread
- Rate of combustion
- Spread (number of sides reached by flames)

MAIN RESULTS

Litter rate of combustion :



Comparison of litter flammability on AS and CS :

Time to ignition is 2-3 x higher on CS with low stand litter and for medium thickness litter

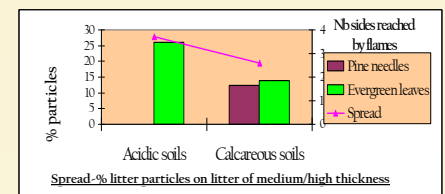
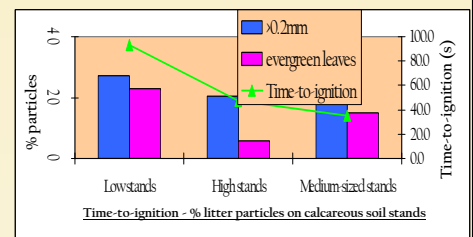
➤ On high *Pinus halepensis* stand (CS)

Spread and rate of combustion are higher on AS with high stand litter and for medium/high thickness litter

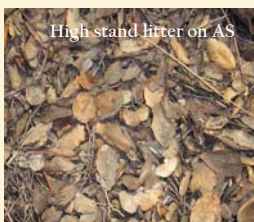


Height of stands and litter thickness have no effect on flaming duration and rate of spread

➤ On high *Quercus suber* stand (AS)



CONCLUSIONS



Acidic soil litters have a higher flammability than calcareous soil litters especially under the highest stands and when they present a substantial thickness. The litter composition (% fine/coarse particles, % needles, % evergreen leaves, etc) as well as a better ventilation in these AS litters could explain for a part this behaviour.

Comparisons with undisturbed litter flammability have to be carried out.



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Context and objectives

Assessing litter (dead fuel) flammability on calcareous and acidic soils in Southern France was a part of the Mediterranean fuel characteristic description carried out in the framework of the European programme Fire Paradox.

Methodology

The sampling of disturbed litter was carried out under stands being characteristic of acidic (*Quercus suber* stands, maquis) and calcareous soils (*Pinus halepensis* stands, mixed Pine-Oak stands, garrigue). The different stand structures (in height, litter thickness, etc) can be induced by the fire regimes having occurred on the study sites.

The litter was collected under three stand heights : low (garrigue and low maquis <2m), medium (high maquis, young Pine stands and mixed stands <10m) and high (*Quercus suber* stands and *Pinus halepensis* stands >10m).

The sampling was carried out on 20m x 20m georeferenced spots spread over the both areas : Massif des Maures (Acidic Provence) and Calcareous Provence (around 30 spots each). Ten samples were collected every two metres on a median transect of each plot, using an iron circle of 18cm diameter and mixed in order to constitute a disturbed litter sample of 36cm diameter with a thickness equal to the mean thickness of the ten samples.

The litter components of each sample were sorted in order to estimate the proportions of leaves, needles, grass, fine and coarse particles (fragments of bark and Pine cone, twigs, etc) and dominant species that might explain the litter flammability.

Each litter sample was burnt on a fire bench at the INRA-Vignères facility, using a glowing firebrand (wooden cube) and an oblique wind of 9.8 kmh⁻¹. Time-to-ignition (s), flaming duration (s), fire spread (number of sides reached by the flames), rate of spread (kmh⁻¹) and rate of combustion (%) were amongst the parameters measured during the experiment.

Main results

The comparison of litter flammabilities of acidic soils vs calcareous soil shows :

- (i) a higher time-to-ignition for medium thickness litters collected under low stands on calcareous soils (garrigue),
- (ii) higher spread and rate of combustion for medium/high thickness litters collected under high stands on acidic soils (*Q. suber* stands),
- (iii) height of stands and litter thickness have no effect on flaming duration and rate of spread.

The litter composition can explain a part of this behaviour :

- (i) time-to-ignition decreases from low to high/medium stands with the decrease of the coarse particle proportion and the evergreen leaf proportion,
- (ii) spread decreases from acidic to calcareous soils with the decrease of evergreen leaf proportion and the increase of the Pine needle proportion.

Conclusions

Acidic soil litters are more flammable than calcareous litters especially under the highest stands and when they present a substantial thickness (>2cm). The composition as well as a better ventilation in these litters could explain this behaviour.

Comparisons with undisturbed litter (collected in place without mixing) flammability have to be carried out in the future.