

## Introduction

Camelina [*Camelina sativa* (L.) Crantz] is an oilseed crop belonging to the *Brassicaceae* family and native in Europe. This species is a multipurpose crop that has been studied in the last years for biobased applications such as bioplastics and biolubricants, or as a feedstock for jet fuels. Camelina could also fit the needs of the feed and food sectors thanks to high seed oil (>30%) and protein (25-30%) contents,  $\alpha$ -linolenic acid content (> 33%), and large amounts of antioxidant compounds, such as tocopherols. Moreover, thanks to its short growing cycle, low input requirement, and high rusticity, camelina can quit its status of niche crop and become a cash cover crop in the Mediterranean area. In the framework of the 4CE-MED project (Camelina: a Cash Cover Crop Enhancing water and soil conservation in Mediterranean dry-farming systems) the optimal sowing date, seeding rate and tillage for camelina have been studied in northern Italy in order to maximize soil coverage before winter, and reduce soil erosion and nitrate leaching.

## Materials and Methods

A plot trial has been set up at the experimental farm of the University of Bologna (Italy) at Cadrano (44° 33' N, 11° 23' E, 32 m a.s.l.) in autumn 2020. The camelina cultivar Alba, supplied by Camelina Company Spain, has been used. The experimental design is a strip-split-plot with four replicates: in the main strips there are the two tillage techniques: minimum tillage (MT) (disk harrowing without soil inversion) vs. no tillage (NT); in the main plots there are two sowing dates: S1 (8<sup>th</sup> October 2020) vs. S2 (28<sup>th</sup> October 2020), and in the sub-plots there are the two sowing techniques: row seeding vs. broadcasting. Emergence rate was surveyed 10 and 20 d after sowing and before winter. Plant counting has been performed in a 1-m-long row in the row-seeded plots, and in a 0.2 x 0.2 m square area in the broadcasted ones. In order to monitor soil coverage, the "Canopeo" app (Oklahoma State University) has been used. Canopeo surveys were carried out from emergence until 14<sup>th</sup> December 2020 (Table 1). ANOVA analysis was performed and if significant differences ( $P \leq 0.05$ ) were observed LSD test was used to separate means.

Table 1. Days after sowing (DAS) and GDD (Growing Degree Days), accumulated from sowing until soil coverage surveys were performed, in camelina grown in Bologna (Italy) during 2020/21.

S1 <sup>A</sup>		S2 <sup>A</sup>	
DAS	GDD <sup>B</sup>	DAS	GDD <sup>B</sup>
20	186	15	129
35	308	26	181
46	360	47	207
67	386		

A=sowing date: S1 = 8/10/2020, S2 = 28/10/2020

B= growing degree days from sowing until the survey, base temperature for calculation 4°C

## Results and Discussion

- Soil coverage was influenced by sowing date (Figure 1). In details, both sowing dates showed a growing trend in soil coverage: S1 reported a +84% increment between 20 and 46 DAS, while an increment of 61% was observed in S2 from 15 to 45 DAS. Moreover, plots sown at the earliest sowing date (S1) accumulated 186 GDD before S2 sowing took place, resulting in a significantly higher soil coverage and biomass accumulation.
- Soil coverage was influenced also by the interaction "sowing date x sowing technique". This interaction revealed higher values of soil coverage in the broadcasted plots compared with the row-seeded ones (67.3% and 60.1% respectively) in S1, while in the second sowing date there were not significant differences between sowing techniques (Fig. 2).
- Emergence rate was higher in no-till plots than in minimum tillage plots (97% vs. 81%, respectively). The interaction between sowing technique and tillage significantly influenced emergence rate. The broadcasted plots showed significantly higher emergence under no tillage, while row-seeded plots did not report significant differences between tillage systems.

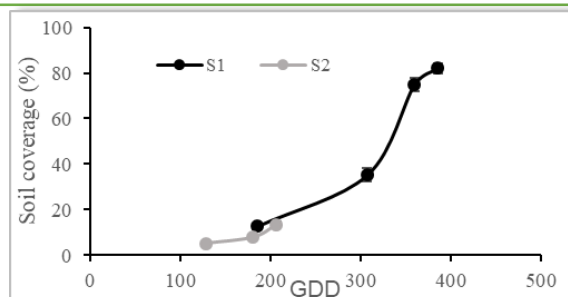


Fig.1 Camelina soil coverage dynamic in relation to GDD accumulation from emergence until the 14<sup>th</sup> of December 2020 in the two sowing dates (S1= 8/10/2020, S2 = 28/10/2020).

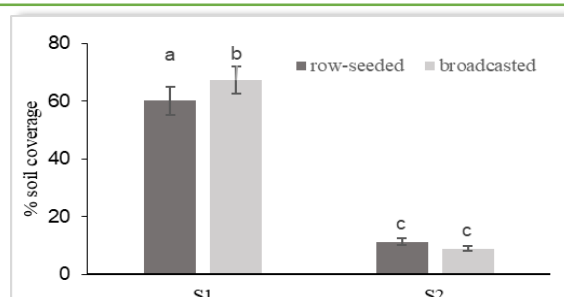


Fig. 2. Camelina soil coverage in response to interaction between sowing date (S1= 8/10/2020, S2 = 28/10/2020) and sowing technique (row-seeding vs broadcasting)

## Conclusions

The present study is still ongoing, so these are preliminary results. The opportunity to grow camelina as cash cover crop is new for Italy, and might increase the farmers' acceptance toward the adoption of cover crops and conservation agriculture. Nevertheless, camelina sown at the beginning of October (Fig.3), due to higher temperatures allowing higher biomass accumulation before winter, was able to cover soil better than when sown later. Moreover, broadcasting seems to promote soil coverage compared with row seeding, when sowing is performed early in the season. Finally, sod seeding confirmed its high suitability for establishing camelina, which was able to achieve equal or better emergence rates compared with minimum tillage.

## Acknowledgments

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Fig. 3 Camelina plants (S1) at rosette stage before winter(A) (15/12/2020) and after winter (B) (20/01/2021), in Bologna (Italy).