SEEDER PERFORMANCE FOR RAPESEED

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Abstract

Rapessed is becoming very interesting mainly due to its importance for biofuels production.
In Portugal there is not a great experience with this crop. It is important to get and spread information about all the aspects involved, including mechanical seeding.
The seed small size and the necessary low density of seeds per hectare – 3 to 5 kg, impose important specifications to select an adequate seeder.
Field trials to evaluate crop and seeder performance were implemented in Northeast of Portugal in autumn 2011 with cultivar *ES Hidromel*.
In this paper we will focus on mechanical seeding. Seeder working time was measured by a chronometer, considering elementary operations like effective seeding time and turning time. Seeder performance is evaluated in hectares per hour. Results are discussed.

Key words: seeder, performance, *Brassica napus*.

1. Introduction (Arial, 11pt, Bold)

In order to get information about *Brassica napus* performance on local conditions, field trials took place in Northeast of Portugal, in two sites located 3 km Northeast city of Bragança. Technical aspects involved in the production are studied.
Seeder preliminary study results are presented and discussed.

2. Material

Seeds: Cultivar *ES Hidromel*
Tractor: John Deere 5620 – 53 kW
Seeder: Sola Trisem 194. (Figs 1 and 2).

FIGURE 1: Seeder at work

FIGURE 2: Seeder coulters and harrow

Seeder characteristics: Working width – 3 m; arms distance – 0.136 m; seed box capacity – 665 L; weight – 760 kg.

The feed mechanism is composed by a fluted roller and a studded roller (Fig. 3).
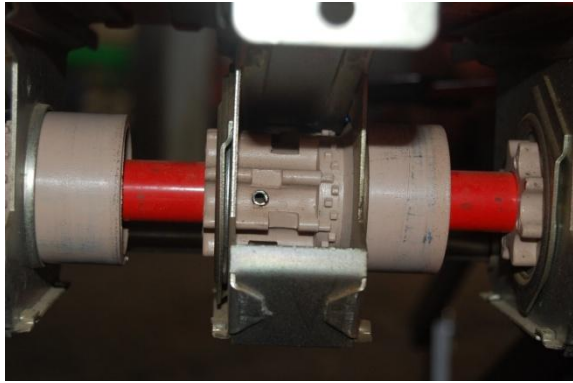

FIGURE 3: Each line feed mechanism

FIGURE 4: Seedbox bottom and seed tubes

One of them must be chosen to get the adequate seed rate (quantity of seed per area). The roller selection is done by an adjustable slide controlled by a shaft passing bellow the seed box. Rollers rotate just below the seed box and draws seeds from the bottom of the box into hoppers at the top of seed tubes [Culpin, C. (1986) pg.103; Shipen *et al* (1980) pg.162].
Selection of fluted roller or studded roller and the feed roller speed of rotation, allow defining the seed rate. The feed roller speed of rotation is defined in a gearbox.
Markers help the operator to drive so that runs are properly spaced.
Coulters are suffolk type .[Culpin, C. (1986) pg.106; Shipen *et al* (1980) pg.163].
A toothed harrow cover the seeds.
The depth of sowing depends on the coulters position adjustable by a bar connected to the depth control bolt.
The two sites used have an area of 70.5 x 73.5 m (5181.5 m^2) – site 1 and 70.0 x 39.5 m (2765m^2) – site 2. (Figs. 5 and 6)
Soil is stony loamy textural. Low slopes – 0% to 2%.

FIGURE 5: Site 1

FIGURE 6: Site 2

3. Methods

To seed 3 to 5 kg.ha^{-1} the studded roller was chosen and the gearbox selected in order to get the roller slowest rotation. Seed rate in sites 1 and 2: 3.9 kg.ha^{-1}. Sowing depth is 0.01 m to 0.02 m.
To evaluate seeder performance, total working time was measured by a chronometer, considering two elementary operations: effective seeding time and turning time.

Seeder performance is evaluated by work capacity – ratio area/time in $m^2.s^{-1}$ or $ha.h^{-1}$.
Knowing the site length and the effective seeding medium time, work speed is presented in $m.s^{-1}$ and $km.h^{-1}$.
Field efficiency is evaluated using the equation:

$$E = \frac{C}{SW}$$

Where :E= field efficiency, as a decimal;

C= work capacity ($m^2.s^{-1}$)

S= work speed ($m.s^{-1}$);

W= seeder width (m).

Field efficiency is a percentage reporting the ratio of the time a machine is effectively operating, to the total time the machine is committed to the operation. [Hunt, D.(1983) pg. 5].

4. Results

4.1. Site 1

TABLE 1: Site 1 – Working time results considering elementary operations

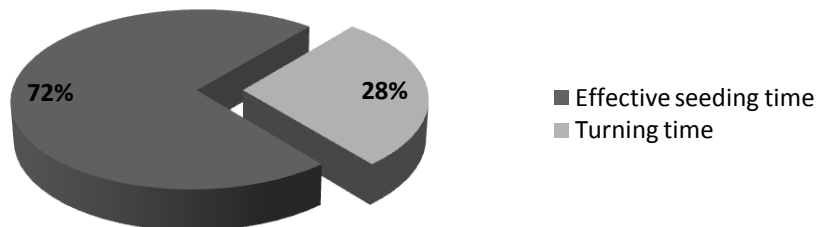|	Average	SD	CV	Min	Max	Total
Effective seeding time (minutes)	0.79	0.113	0.14	0.55	1.08	19.76
Turning time (minutes)	0.318	0.086	0.27	0.2	0.63	7.64
Total time (minutes)						**27.4**

FIGURE 7: Site 1 - elementary operations time expressed as percentage of total time.

Seeding medium speed: 1.49 $m.s^{-1}$ (5.4 $km.h^{-1}$)

Field efficiency: 0.71

Work capacity: 3.15 $m^2.s^{-1}$ (1.13 $ha.h^{-1}$)

4.1. Site 2

TABLE 2: Site 2 – Working time results considering elementary operations

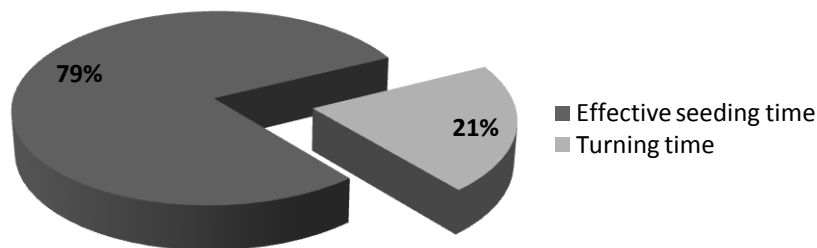|	Average	SD	CV	Min	Max	Total
Effective seeding time (minutes)	0.759	0.116	0.152	0.56	0.95	9.87
Turning time (minutes)	0.221	0.050	0.228	0.13	0.34	2.65
Total time (minutes)						**12.52**

FIGURE 8: Site 2 - elementary operations time expressed as percentage of total time.

Seeding medium speed: 1.54 $m.s^{-1}$ (5.5 $km.h^{-1}$)

Field efficiency: 0.8

Work capacity: 3.68 $m^2.s^{-1}$ (1.33 $ha.h^{-1}$)

5. Discussion

Despite these are preliminary results, it is possible to assume that seeder performance is satisfactory.

Field efficiency – 0.71 to 0.8 - and operating speed – 5.4 $km.h^{-1}$ to 5.5 $km.h^{-1}$ - are inside range values mentioned by Hunt, D. (1983) pg.5.

Seeder reliability is good. All the procedures to seed with the seed rate required are easily implemented.

It is necessary in the next future to evaluate the seeding result. For instance, is rapeseed number of plants per area enough for a satisfactory production?

More field trials are needed to adjust these preliminary results.

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