

CHIA: A NEW CROP FOR ORGANIC PRODUCTION IN QUÉBEC, RESULTS FROM 2015 PRELIMINARY TRIAL



J. BOISCLAIR^{1*}, G. RICHARD¹, T. BOISLARD¹, T. PHILLIPS², M. LEBLANC¹, M. GRENIER¹, L. BELZILE¹ AND C. THIBAUT¹

INTRODUCTION

For the last few years, functional foods have arisen a lot of attention around the world due to increased interest in healthy lifestyle. Chia seeds are very high in omega-3 fatty acids which have many health benefits (Mohd Ali et al. 2012; Ayerza and Coates 2005). Chia seeds are now used in many processed foods such as cereals and granola bars. Chia, *Salvia hispanica* L. (Lamiaceae), could become a crop contributing to the diversification and profitability of organic farms in Québec. Originating from South America, chia is a short-day flowering plant and has only been recently grown in North America. Researchers from Kentucky have been able to develop lines which are able to flower under long days, may be sown as late as the end of June and still reach maturity (Jamboonsri 2010; Jamboonsri et al. 2012; Kummer and Phillips 2012).

Preliminary trial 2015 results are presented. In 2016 and 2017, a two-year project will be conducted at the Organic Agriculture Innovation Platform (Saint-Bruno-de-Montarville, Québec).

2015

EXPERIMENTAL DESIGN:

Table 1. 2015 Preliminary trial: comparison of three chia lines and two seeding rates.

Treatment*	Line	Color	Seeding rate
1	A (G8 - 13.R2N)	black	6 kg/ha
2			2 kg/ha
3	B (W13.1)	white	6 kg/ha
4			2 kg/ha
5	C (G3 - 14.21)	black	6 kg/ha
6			2 kg/ha

* unreplicated treatments

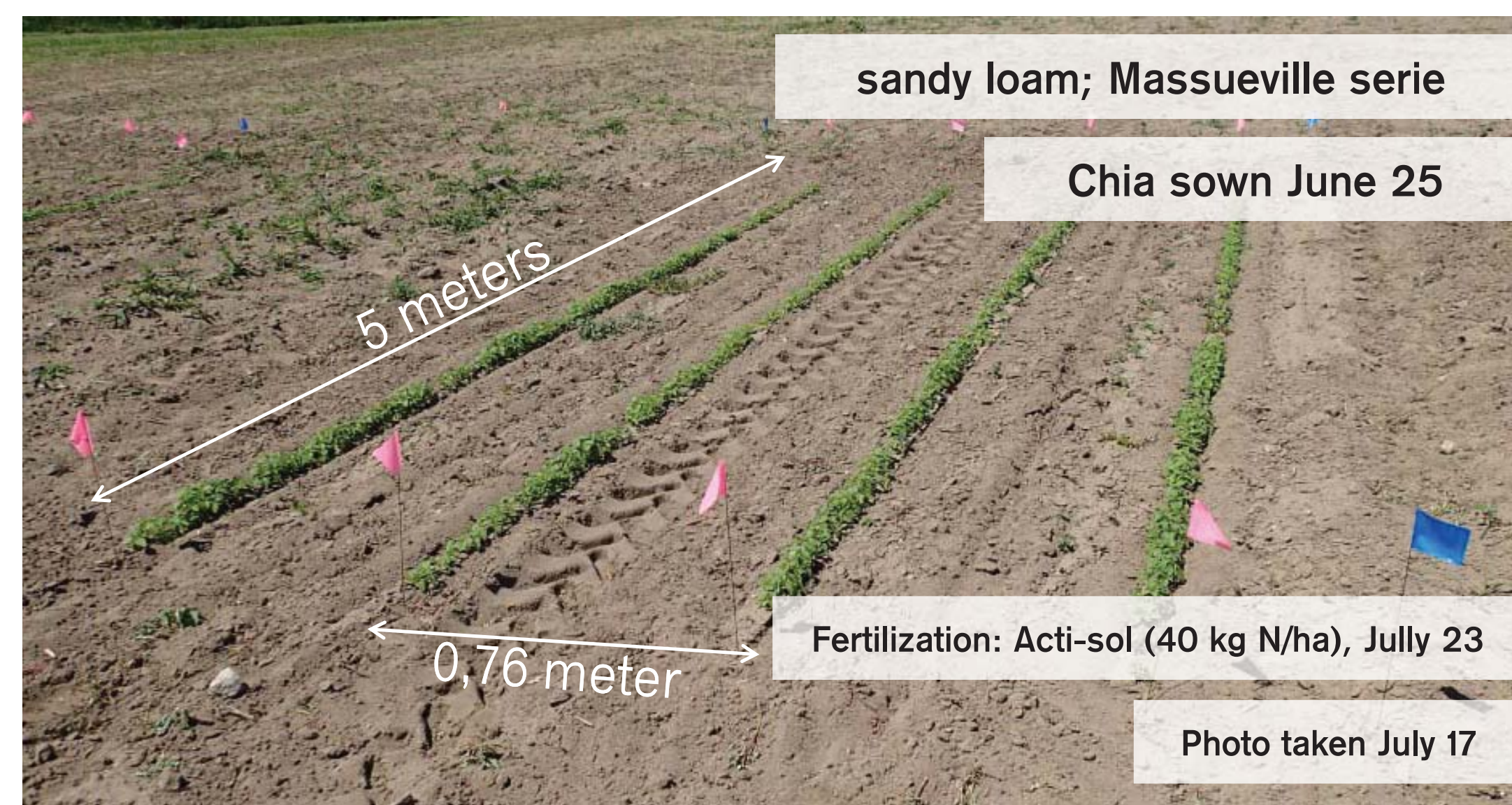


Figure 1. 2015 Chia Plot.

DATA:

Yield: kg/ha for manual and mechanical harvesting

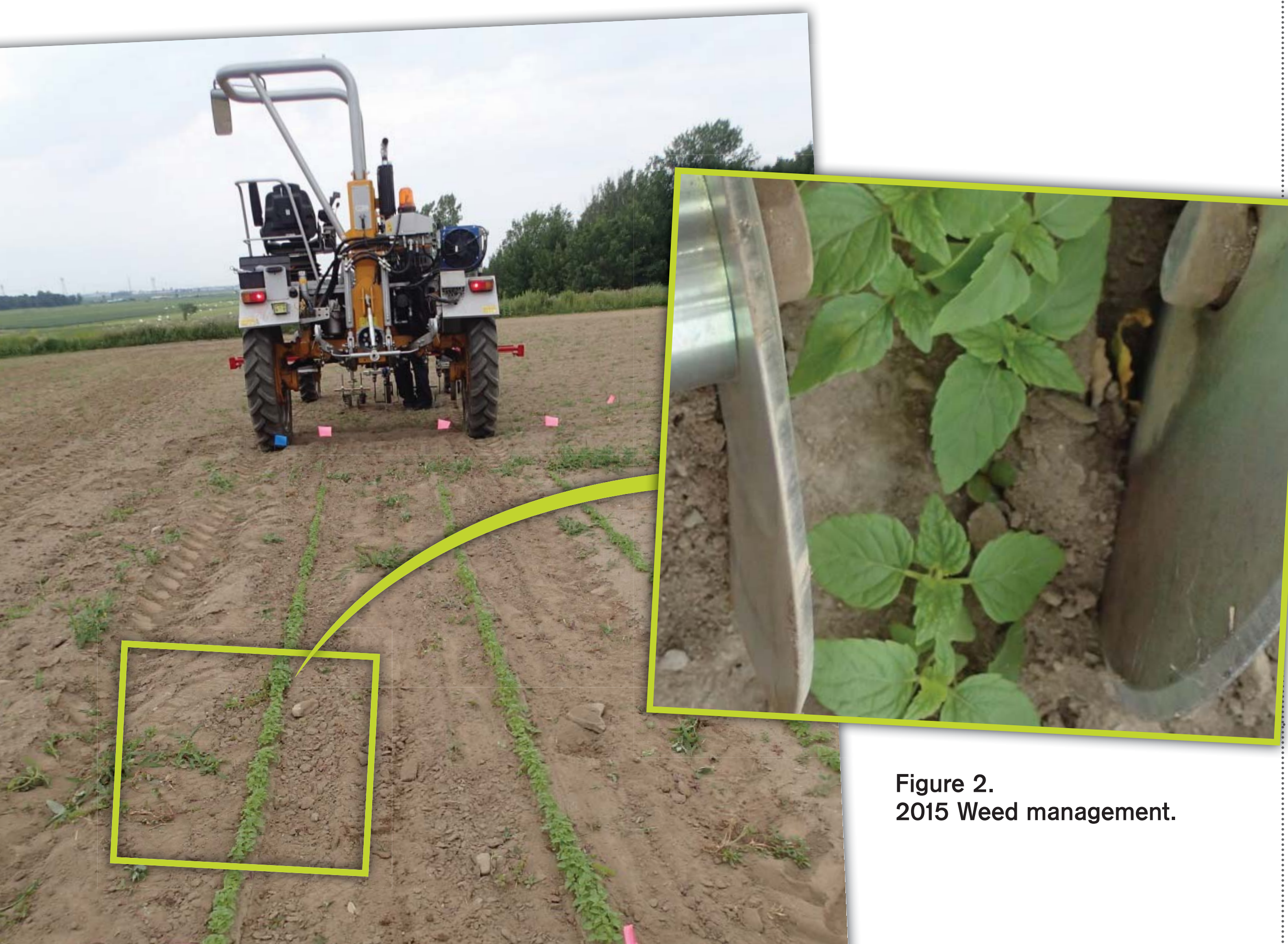


Figure 2. 2015 Weed management.

OBJECTIVES

2015-PRELIMINARY TRIAL:

- to compare three chia lines and two seeding rates and to determine which line could be of interest for 2016-2017 investigations.

2016-2017 INNOVATION RESEARCH PROJECT:

- to compare the seed yields from chia crops sown at three different dates and three seeding rates.
- to perform an economic analysis based on the production costs in order to determine the feasibility of chia production in Québec.

MATERIAL AND METHODS

EXPERIMENTAL SITE:

Organic Agriculture Innovation Platform located in Saint-Bruno-de-Montarville, Québec, Canada

2016-2017

EXPERIMENTAL DESIGN:

- Two-factor Split-plot Design
- Main plot : seeding dates: 2016: May 25, June 3 and 22
- Subplot : seeding rates: 2, 4 and 6 kg/ha
- Four replicates
- One chia line: G8 (lot 13.R2N).
- Plot size: 4 rows of 3 m long and 0,76 m between rows

DATA:

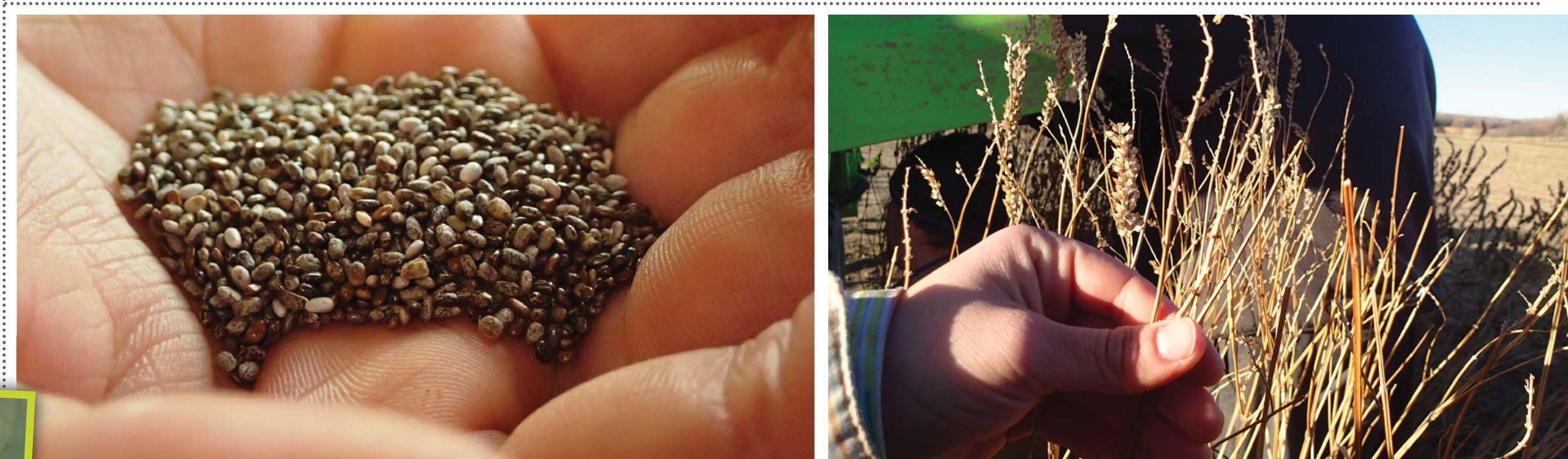
- Growth stages:
 - Number of days for beginning of flowering period, 50% flowering and full bloom, beginning of seed fill and maturity
- Chia plant population before harvest
- Yield: kg per hectare
- Chia biomass: fresh and dry at harvest
- Chia plant height at harvest
- Weed pressure:
 - Density and biomass of monocots and dicots at harvest
- Insect scouting:
 - Insect species and diseases observed at weekly scouting

STATISTICAL ANALYSIS:

Yield data will be analyzed using SAS Proc Mixed procedure for analysis of variance and treatment means will be compared. Insect and disease will only be subjected to descriptive analysis.

ECONOMIC ANALYSIS:

- Calculation of the variable costs of organic chia production: seeding, fertilization, weeding, etc.
- Market study in order to know the supply requirements of organic chia buyers (volumes and price), compared to other external sources of supply
- Evaluation of the target price of organic chia taking into account the profit margin on variable costs



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RESULTS AND DISCUSSION

The following results are from the 2015 preliminary trial as the results from 2016 experimentation are not available at this point.

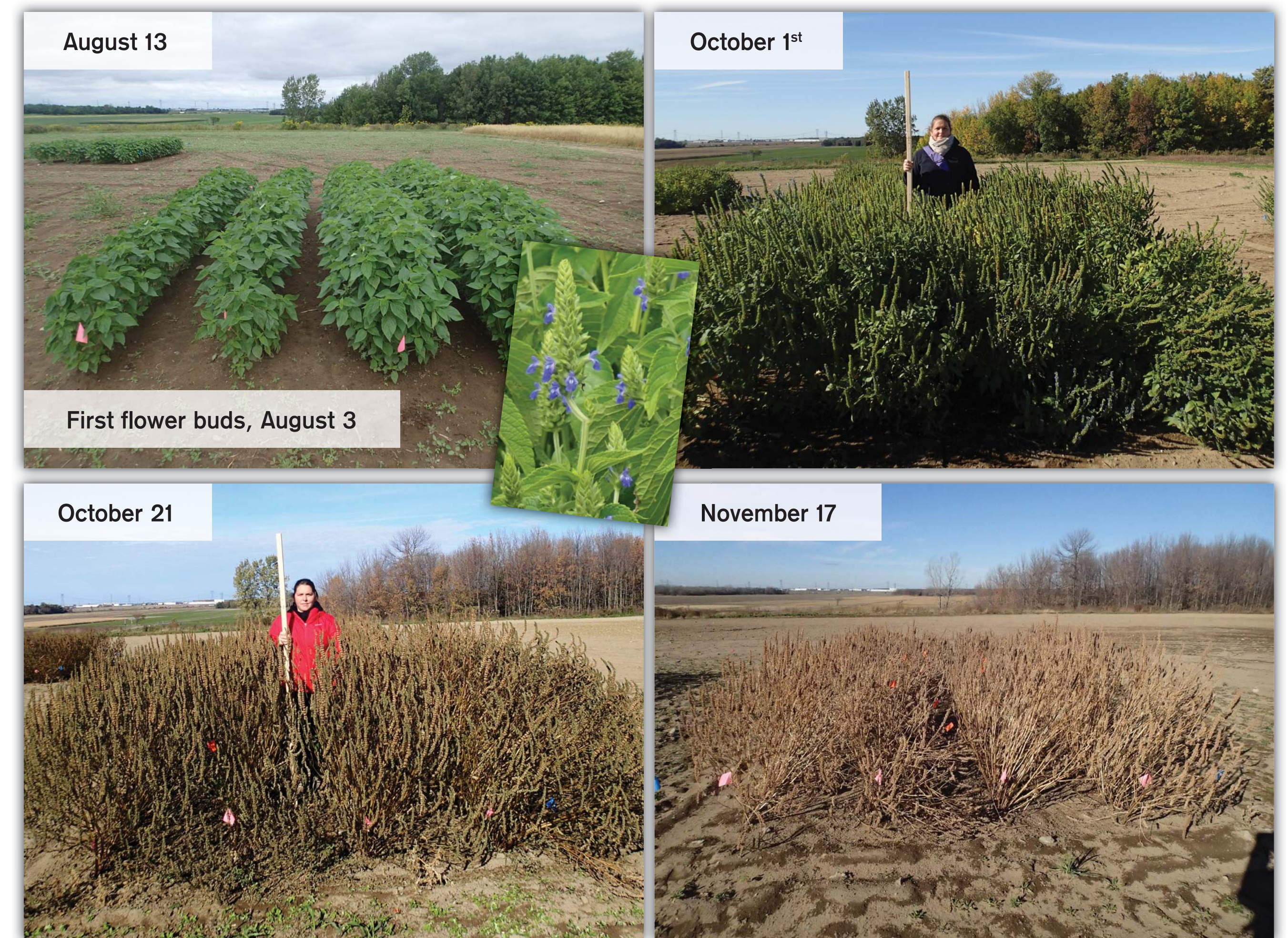


Figure 3. 2015 Chia development.

CHIA SEED YIELD

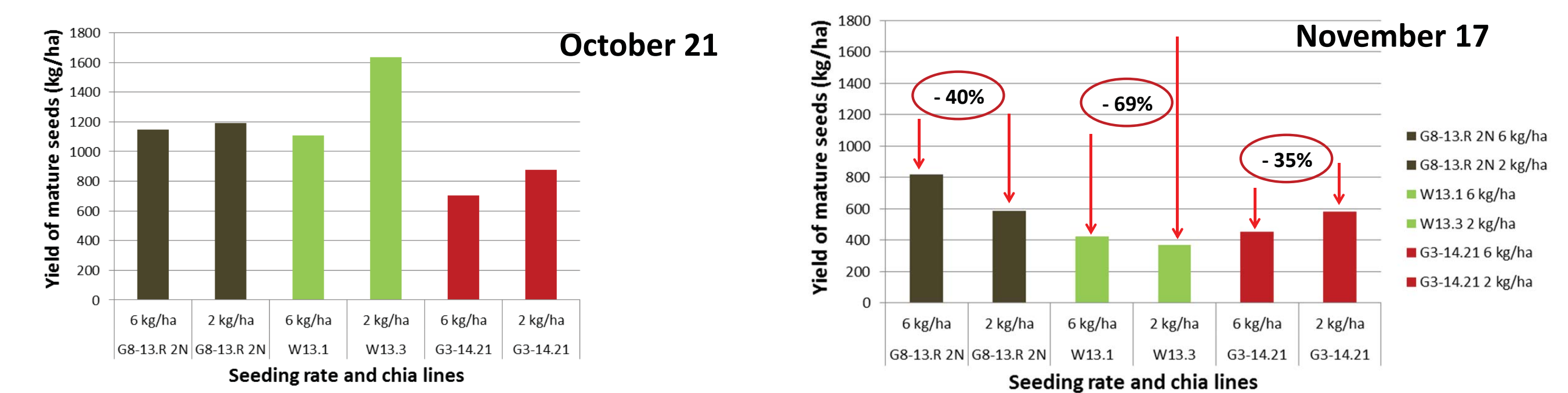


Figure 4. Seed yield from manual harvesting of three chia lines at two seeding rates, 2015.

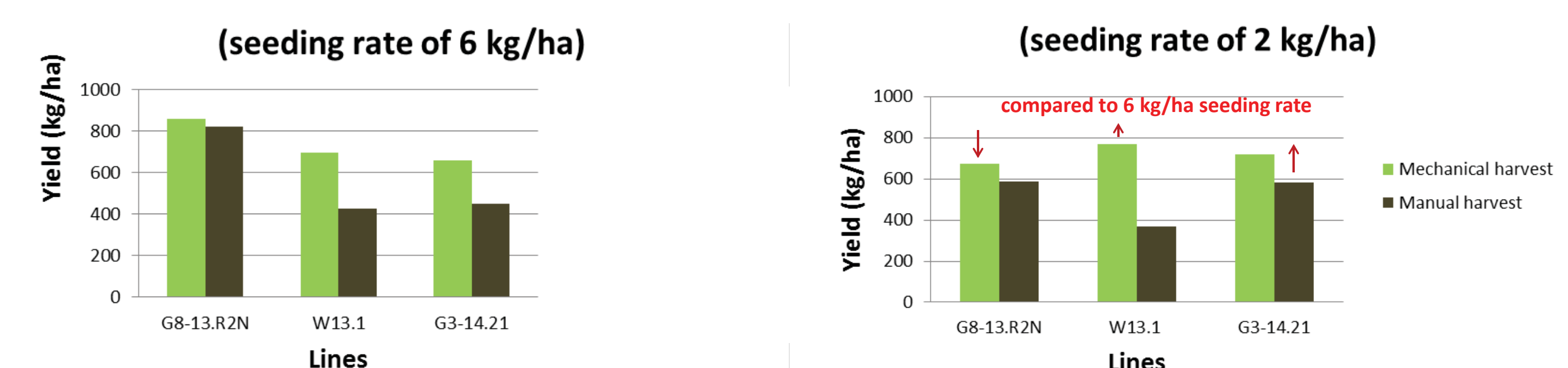


Figure 5. Chia seed yield from manual and mechanical harvesting on November 17, 2015.

During the 2015 preliminary trial, only red-headed flea beetle, *Systema frontalis*, (Coleoptera: Chrysomelidae) was observed feeding on the chia plants making very slight damage on the foliage. Actually, Kummer and Phillips (2012) reported no pest problem associated with chia in Kentucky. Chia appeared to have a great ability to compete with weeds under the 2015 summer conditions. 2016 and 2017 investigations will contribute to have a better idea of the chia competitiveness.

Commercial chia production usually yields between 500 and 600 kilograms per hectare. (Coates and Ayerza 1996). In Argentina, average yield is 606 kilograms per hectare (Coates and Ayerza 1998). However, some growers may get yields reaching up to 1 260 kilograms per hectare. In this preliminary trial, mechanical harvest led to yield of more than 600 kilograms per hectare for all three lines with the best yield being a little over 800 kilograms per hectare for the G8-13.R2N line which is the chosen one for the 2016 and 2017 investigations (Figure 5). This is quite interesting considering the late seeding date June 25th.

Although, one would expect to get better yield with a higher seeding rate, this preliminary trial did not allow to make this observation. The 2016 and 2017 rigorous experimental design should contribute to a better understanding of the difference between 2, 4 or 6 kilograms per hectare chia seeding rates.

One of the challenges with chia crop is the determination of the optimal harvesting time. Chia is very susceptible to seed shattering. This is clearly shown in our harvesting results as quite a lot of seeds were shattered between October 21st and November 17th when the mechanical harvesting took place (Figure 4). This will be addressed in our 2016 and 2017 investigations as harvesting will take place earlier.