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7.0 Best Management Practices-flax demonstration

Project duration: 2018-2019
Collaborators: Manitoba Diversification Centres – Melita, Arborg, Roblin and Carberry

Objectives

- To provide a backdrop for field day extension on best management practices for successful flax production.

Background

Flax (*Linum usitatissimum*) production was introduced in the northern U.S. and Canada around 1800. Two types of flax that are grown include fiber flax grown especially in Europe for the fiber in its stem, and seed flax grown for the oil in its seed and nutritional value for humans and livestock (NDSU, 2007). In Canada, the majority of producers grow seed flax for processing into linseed industrial oil and linseed meal that is fed to livestock. In order to achieve higher yields and sustainable flax production, producers need to implement best flax management practices.

Best management practices in flax are activities and procedures that are designed to enhance sustainable agricultural production and these include; nutrient management, seeding date, rotation of flax with other crops, tillage operations, weed control methods, and pests and disease control. Historically, producers were not much worried about timing of these operations which resulted in significant yield losses for their flax crop. Proper timing of operations and adequate nutrient management does not only result in higher yields but also sustainable agricultural land use (Manitoba Agriculture, 2018).
Flax requires a season length of nearly 110 days and out of these days, 50 are required for the vegetative stage, 25 for flowering and 35 between flowering and maturity. Considering that the Canadian Prairies are characterized by a short growing season, the crop is ideal for production in this region because reaching maturity is assured if seeding is done early (Johnston et al., 2002). Flax seeding dates vary among regions but it is best to establish the crop early, especially during the first week of May in order to ensure full utilization of the growing season in the case of the Prairies that experience an early fall frost. Practices such as nutrient application must be based on soil test results as well as considering the previous crop,

for instance, if the previous crop was an annual legume, nitrogen application must take into consideration nitrogen credits contributed by the legume hence reducing chances of over supplying nutrients to the flax crop (NDSU, 2007). Therefore, this small plot trial was conducted to demonstrate different management approaches to flax production and to recommend best management practices to flax producers.

Materials and Methods

Three farming practises: BMP, Improving and Historic farmer were established as double strip plots with three blocks each. Plots were not randomized. Plots at Melita measured 9 m long x 2.88 m wide. Seeding dates differed depending on the farming practices and agronomic practices were applied as indicated in Table 7a.

Table 7a: Treatment description for Best Management practices of flax at Melita in 2019

Action	Historic Farmer	Improving Farmer	BMP Farmer
Pre-Emergence Herbicide	None	Roundup (full 1L equivalent ac^{-1})	Roundup + Authority + Aim
Stubble	Oat	Oat	Oat
Seed Date	31 May 2019	21 May 2019	06 May 2019
Seed Rate	42 lbs ac^{-1}	56 lbs ac^{-1}	70 lbs ac^{-1}
Seed Depth	1 inch.	1 inch.	5/8inch.
Target Fert. (lbs/ac Soil + Applied)		108-35-20-7-2Zn plus 5.0N liquid	108-35-20-7-2Zn (NPKS)
In crop Herbicides	Buctril M	Group 1 + Buctril M	Select 0.12 L ac^{-1} + 0.5% v/v Amigo
Fungicide	None	Headline EC	Priaxor at 30% flowering
Desiccant	Swath	Swath	None

Data collected included: plant vigor on a 1 to 5 scale at 3 weeks after seeding, 2 x 1 m plant count at emergence, disease rating, flower and maturity date, grain moisture content and yield. Since treatments were not randomized due to the nature of the demonstration trial, means were determined to appreciate differences in flax management systems.

Results and discussion

Seeding dates differed between sites with Melita seeding all demonstration plots by May 21 while Arborg seeded the last treatment on June 4 (Table 7b). At Arborg, plant density in BMP farmer plots was 323 ppms while the Improving and Historic farmer plots had 332 and 346 ppms, respectively. At Melita, plant density was 500 ppms in BMP farmer plots seeded on 6 May while the Improving farmer, seeded on 13 May, and Historic farmer, seeded on 21 May, had 474 and 248 ppms, respectively. Differences between the two sites could be explained by timing of seeding as well as differences in agro-ecological zones.

Plant height at flowering was 47, 50 and 53 cm for BMP, Improving and Historic farmer plots at Arborg, respectively. This parameter was not measured at Melita. At Arborg, the expectation was that the early seeded demonstration plots would but that was not the case, probably due to unfavorable soil conditions at seeding. Days to reach physiological maturity differed between sites. Although Historic farmer plots were the last to be seeded at Arborg, they required fewer days (84) to reach maturity compared to Improving and BMP farmer plots, which required 92 and 96 days, respectively. On the contrary, Improving farmer plots required 99 days while BMP and Historic farmer plots required 94 and 97 days to reach maturity at Melita, respectively. There were no observed differences in lodging among flax management systems and between the two sites.

At both sites, BMP farmer plots recorded more grain yield compared to Historic and Improving farmer plots. The highest yield was 38 bu ac^{-1} for BMP while the lowest was 14 bu ac^{-1} at Melita. At Arborg, grain yield ranged from 27 to 34 bu ac^{-1}. Based on the results from this demonstration trial, Historic farmer practice appear not to be a viable option as a management strategy for flax production as it results in significantly low grain yield as observed at Melita. It would be best for flax producers to consider BMP farmer practice, which involves application of nutrients based on soil tests, early seeding date to maximize on growing season length and effective control of weeds, disease and insect pests, which is all based on scouting.

Table 7b. Seed date, mean plant density, plant height, days to maturity, lodging, plant vigor and yield obtained from 3 flax management practices at Arborg and Melita in 2019

Arborg						
Method	**Seed Date**	**Emergence (ppms)**	**Plant Height (cm)**	**DTM**	**Lodging 1-5**	**Yield bu ac^{-1}**
Historic farmer	04-Jun	342	53	84	1	27
Improving farmer	22-May	336	50	92	1	31
BMP farmer	15-May	323	47	96	1	34
Melita						
Method	**Seed Date**	**Emergence (ppms)**	**Plant vigor (1-5)**	**DTM**	**Lodging 1-5**	**Yield bu ac^{-1}**
Historic	21-May	248	3.5	97	1	14
Improving	13-May	474	4.3	99	1	26
BMP	06-May	500	5	94	1	38