

CROP: Garlic (*Allium sativum* L.), cv. Porcelain

NAME AND AGENCY:

CRANMER TJ¹, VICKERS S¹

¹Ontario Ministry of Agriculture, Food and Agri-business, Guelph, ON

Tel: (519) 835-3382

Fax: (519) 826-4964

Email: travis.cranmer@ontario.ca

TITLE: EFFECT OF PLANTING DATES AND INTERCROPPING COVER CROPS ON GARLIC SURVIVABILITY AND BULB WEIGHT IN THE 2024-2025 FIELD SEASON.

METHODS: Garlic cloves were planted by hand near Dashwood, Ontario, in Huron clay loam, on six planting dates in 2024 (21 August, 17 September, 8 October, 22 October, 19 November, and 2 December) and 1 April in 2025. The trial was arranged in a randomized complete block design with four replicates. Each replicate consisted of five rows (3 m long) with 15 plants per row for a total of 75 plants per plot taking up 7 m² (75 sq ft) per experimental unit. Bulbs for the trial were set aside 21 August 2024 and cracked immediately prior to planting at each planting date. The remainder of the bulbs were stored at an average temperature of 16 °C and a relative humidity of 40 % until the last planting 1 April 2025. Rows were dug prior to planting and cloves were covered with 2–5 cm of soil and grown under standard cultivation conditions. Oats, sorghum Sudan grass and crimson clover were also sown on 21 August after the garlic was planted. Oats were seeded at a rate of 112 kg/ha (100 lbs/ac) and sorghum Sudan grass was seeded at a rate of 56 kg/ha (50 lbs/ac). Crimson clover at a rate of 34kg/ha (30 lbs/ac) was also planted to evaluate the overwintering effects of weed suppression in a single plot that was not replicated and not included in the statistical analysis. Crimson clover was sown as a spring cover crop 1 April 2025 at the fall rate of 34 kg/ha (30 lbs/ac). One treatment planted 21 August was left un-weeded as a weedy check with the 21 August planting date acting as the weed-free check. Plots planted with garlic on other various dates without cover crops were hand weeded as necessary. No supplemental irrigation was added in 2025. Garlic was harvested, and cover crop and weed biomass was assessed on 21 July after an average of 50 % of the garlic leaves had senesced. After harvest, bulbs were cleaned, placed in mesh bags, and were cured in a pallet box within a forced air-drying shed for 15 days with garlic dry weights collected on 8 August. Cover crop and weed biomass samples were air-dried for 14–20 days, and dry biomass weights were recorded. Data were analyzed using SAS version 9.3 (SAS Institute, Cary NC). Means were separated using Tukey-Kramer multiple mean comparison test ($P = 0.05$).

RESULTS: Different planting dates in the fall had no statistical differences in bulb weights however the September 15th planting date was numerically the highest yielding treatment. There were no statistical differences in bulb weight between the cover crop treatments, however they were numerically lower than the comparative August 21st planting without cover crops (**Table 1, Figure 1**). The cover crop treatments did not have statistical differences in reducing weed biomass, however all cover crop treatments had numerically lower weed biomass than the weedy check plot (**Table 2, Figure 1**).

CONCLUSIONS: The 15 September, 8 October and 22 October planting dates for garlic provided the best yields with no significant differences. Planting earlier (21 August) and after 19 November resulted in lower yields (**Figure 1**). This is consistent with trials from the previous two years where earlier planting dates resulting in higher yields at harvest (**Figure 2**). Significant snowfall occurred 1 December 2024 and continued during the 2024–2025 winter for Dashwood, ON providing a blanket of insulation before the ground was frozen (**Figure 3**). Although crimson clover winterkills in some Ontario regions, the single replication of the fall-planted crimson clover survived the winter and grew rapidly in the spring, providing good weed suppression (**Figure 4**). The oat and sorghum Sudan cover crops planted 21 August with the earliest planted garlic did not significantly impact yield compared to the garlic-only planting. Cover crops

did not significantly reduce weed presence in the trial plots (**Table 2**). In the 2023–2024 trial, garlic was intercropped/overseeded with a fall-seeded oat cover crop which provided good weed suppression and resulted in a relatively small yield drag. However, in the 2024–2025 trial, the presence of grassy weeds greatly reduced yields in the fall-seeded oat and Sorghum Sudan plots indicating that these cover crops may only be suitable in fields that have relatively good weed control to begin with, and where broadleaf weeds are the primary concern.

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Table 1. Garlic survival and green weight measurements collected 21 July, and dry weights collected 8 August for various planting dates on garlic grown near Dashwood, Ontario, 2024–2025.^{1,2}

Garlic Planting Date	Cover Crop	Cover Crop Planting Date	% Plant Survival	Green Weight for 30 Bulbs (kg)	Dry Weight for 30 Bulbs (kg)	Bulb Dry Weight (g)
21 August 2024	--	--	98.2 ns	1.94 ab	1.51 ab	50.2 ab
15 September 2024	--	--	99.7	2.25 a	1.76 a	58.7 a
8 October 2024	--	--	99.3	2.17 a	1.71 a	57.1 a
22 October 2024	--	--	99.7	2.14 a	1.67 a	55.6 a
19 November 2024	--	--	94.0	1.97 ab	1.52 ab	50.8 ab
2 December 2024	--	--	96.0	1.56 ab	1.23 ab	40.9 ab
1 April 2025	--	--	75.0	1.24 b	0.96 b	31.9 b
21 August 2024	Oats	21 August 2024	99.7	1.79 ab	1.37 ab	45.8 ab
21 August 2024	Weedy check	--	99.0	1.54 ab	1.16 ab	38.6 ab
21 August 2024	Sorghum Sudan	21 August 2024	98.7	1.89 ab	1.47 ab	48.9 ab
21 August 2024	Crimson clover	1 April 2025	99.7	1.56 ab	1.22 ab	40.7 ab
21 August 2024 ¹	Crimson clover	21 August 2024	98.7	1.81	1.43	47.7

¹ All planting dates had four replications except for the 21 August 2024 garlic and fall crimson clover planting date which consisted of a single plot and was not included in the statistical analysis.

² Numbers in a column followed by the same letter are not significantly different at $P = 0.05$.

Table 2. Cover crop and weed green weight collected 21 July, and dry weights collected 8 August for various planting dates near Dashwood, Ontario, 2024–2025.^{1,2,3}

Garlic Planting Date	Cover Crop	Cover Crop Planting Date	Cover Crop Green Biomass (g)	Cover Crop Dry Biomass (g)	Weed Green Biomass (g)	Weed Dry Biomass (g)
21 August 2024	Oats	21 August 2024	0.0 ³ b	0.0 ³ b	50.9 ns	21.4 ns
21 August 2024	Weedy check	--	0.0 b	0.0 b	82.8	42.9
21 August 2024	Sorghum Sudan	21 August 2024	0.0 ³ b	0.0 ³ b	90.6	34.3
21 August 2024	Crimson clover	1 April 2025	47.0 a	23.8 a	85.9	34.9
21 August 2024 ¹	Crimson clover	21 August 2024	42.0	37.9	18.5	6.0

¹ All planting dates had four replications except for the 21 August 2024 garlic and fall crimson clover planting date which consisted of a single plot and was not included in the statistical analysis.

² Numbers in a column followed by the same letter are not significantly different at $P = 0.05$.

³ Cover crop winterkilled, so no biomass was collected the following summer.

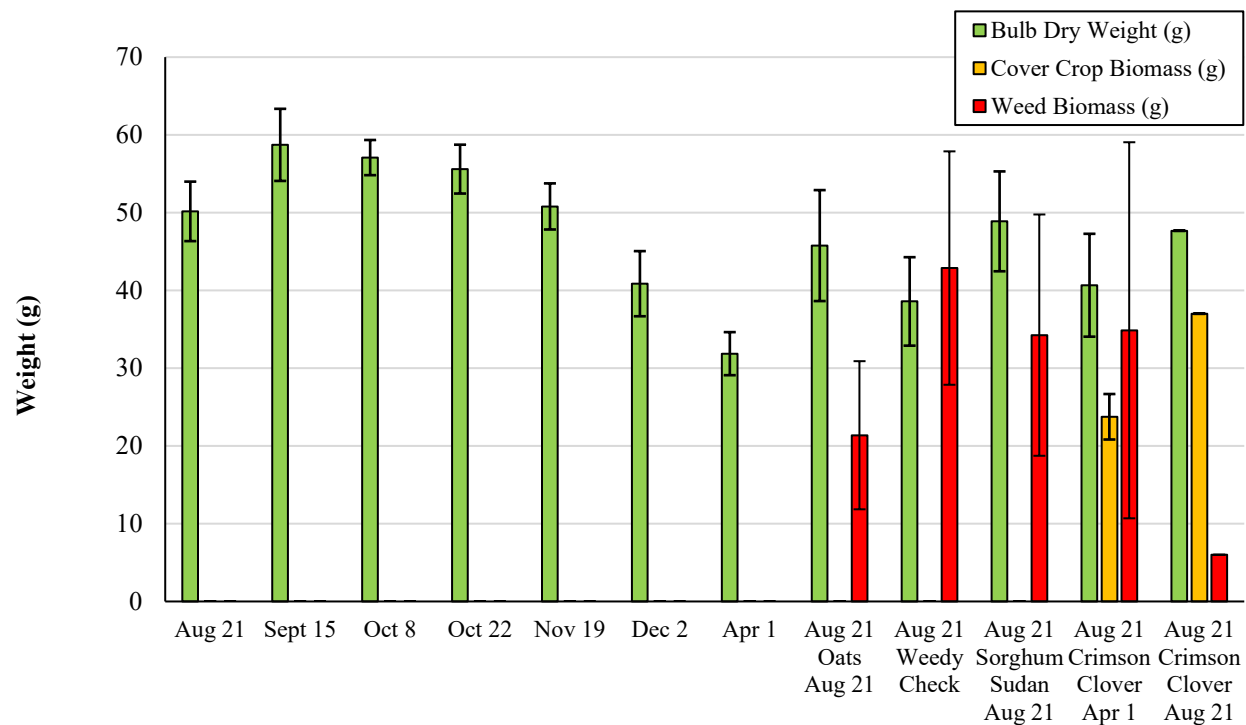


Figure 1. Cured garlic bulb weight (g) dry cover crop biomass (g) and dry weed biomass harvested 21 July 2025. All planting dates had four replications except for the 21 August 2024 garlic and fall crimson clover planting date which consisted of a single plot and was not included in the statistical analysis.

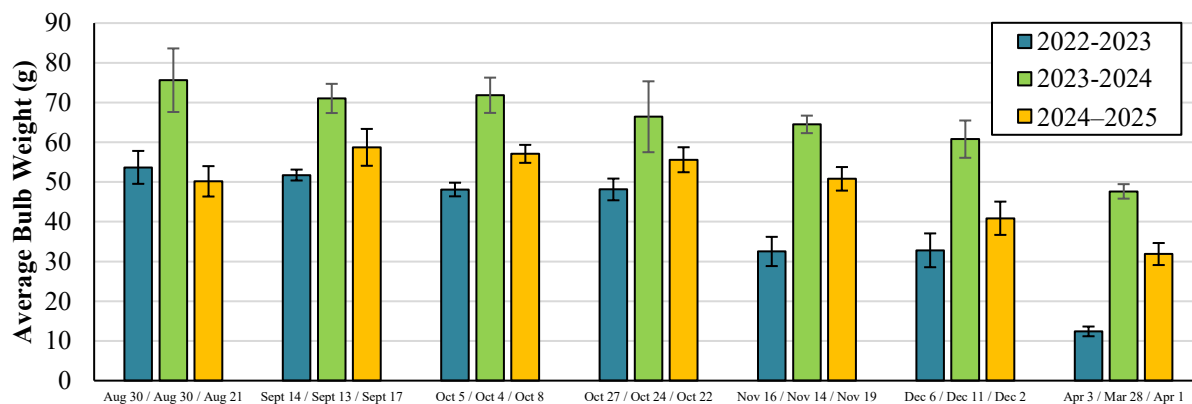


Figure 2. Cured garlic bulb weight (g) over seven planting dates from 2022–2025.

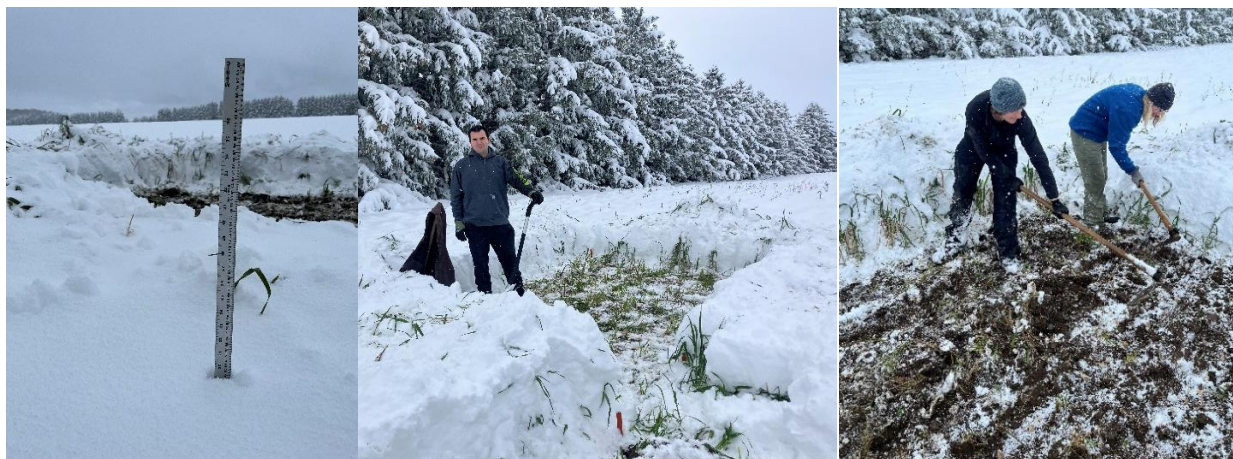


Figure 2. Over 46 cm (18 in.) of snow occurred 1 December 2024 and continued during the 2024–2025 winter for Dashwood, ON providing a blanket of insulation before the ground was frozen. Snow was cleared for the four plots of the 2 December 2024 garlic planting date.



Figure 4. Although crimson clover winterkills in some Ontario regions, the single replication of the fall-planted crimson clover survived the winter and grew rapidly in the spring, providing good weed suppression. Photo taken 3 June 2025.

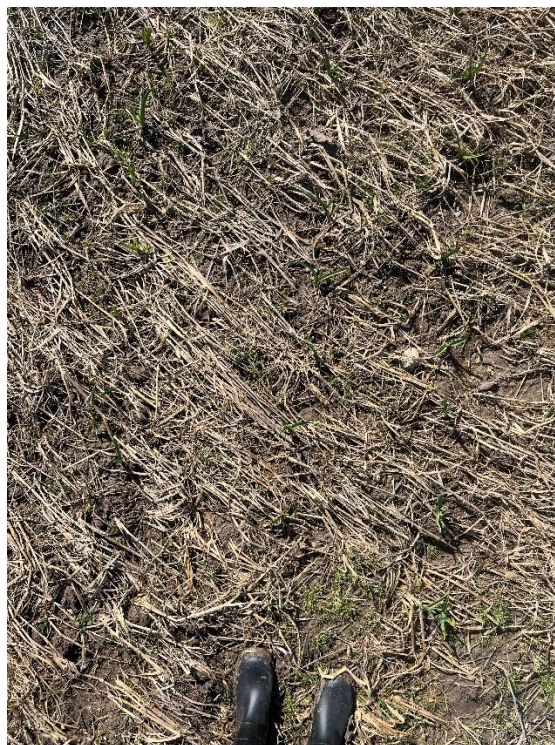


Figure 5. A) Oats seeded on August 21, 2024. Photo taken on 22 October 2024. **B)** Winterkilled oat residue from seeding on 21 August 2024. Photo taken on 1 April 2025.



Figure 6. A) Sorghum Sudan grass seeded on 21 August 2024. Photo taken on 22 October 2024. **B)** Winterkilled sorghum Sudan grass residue from seeding on 21 August 2024. Photo taken 1 April 2025.

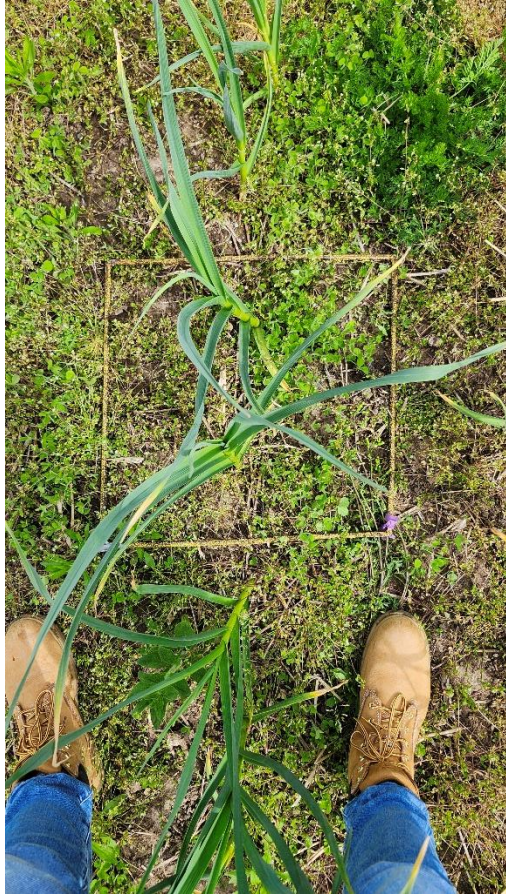


Figure 6. A) Crimson clover seeded on April 1, 2025. Photo taken on May 27, 2025. **B)** Overwintered crimson clover seeded on August 21, 2024. Photo taken July 21, 2025.