

Optimizing Planting Dates and Variety Selection for Winter Pea Establishment in the Northern Environment

Qasim A. Khan, Mike Ostlie, and Steve Zwinger

Interest in growing winter peas in the Northern Plains is increasing, driven by the availability of new cold-hardy varieties. However, determining the optimal planting time remains a significant challenge due to the region's short growing season and harsh winter conditions. Planting too early can lead to excessive vegetative growth, depleting the carbohydrate reserves needed for overwintering and increasing the risk of winterkill. On the other hand, planting too late may not allow sufficient time for root establishment, compromising the crop's ability to survive the winter. The ideal planting window is typically 4–6 weeks before the first hard frost. Optimal soil temperatures for germination range from 40–50°F, but dry or wet fall conditions can complicate planting schedules. Selecting a cold-hardy variety is critical for improving winter survival and ensuring successful growth.

This study evaluates the performance of winter peas planted on four different dates over three years (2022–2024) to assess the impact of planting date and variety on winter survival, biomass production, and grain yield. Field trials were conducted on Certified Organic land at the Carrington Research Extension Center (CREC). Four winter pea varieties, Blaze, Icicle, Windham, and WyoWinter, were sown on four planting dates: mid-September (PD1), late-September (PD2), early October (PD3), and mid-October (PD4). The experimental design was a randomized complete block with four replications. Data collected included fall and spring stand percentages, flowering days, aboveground biomass yield in 2022, and grain yield in 2023. Due to extreme winter conditions, all plant stands were lost in 2024, preventing data collection for that year.

The study highlights the complex interaction between planting date, variety selection, and winter conditions in determining winter pea performance in the Northern Plains (Table 1). Under extreme winter conditions, all varieties experienced winterkill, as evidenced by the total crop failure in the open winter of 2024, regardless of planting date. However, in milder winters, winter survival varied with planting date and variety. Late-September (PD2) and early October (PD3) planting dates generally resulted in better fall establishment and winter survival, with WyoWinter and Blaze showing better overall adaptability. Late planting (PD4) demonstrated potential when seeds emerged in the spring, as observed in 2022, where spring-emerged Blaze and WyoWinter varieties produced measurable biomass, indicating resilience to delayed emergence. However, when peas at PD4 emerged in the fall, as in 2023, they experienced lower survival rates and greater yield variability compared to earlier planting dates.



September-planted winter peas in November of 2023.

Table 1. Planting date and variety effect on pea winter survival, biomass and grain yield.

Planting Date	Variety	2022				2023		Grain Yield bu/a
		Fall Stand %	Spring Stand %	Flowering date	Biomass lb/a	Flowering days	Maturity days	
1	Blaze	91.3	1.3	--	0	6/5	202.8	24.51
2	Blaze	94.3	56.3	6/14	732	6/6	203.5	27.48
3	Blaze	88.8	25.0	6/16	272	6/10	205.8	33.15
4	Blaze	--	56.3	6/17	1005	6/10	206.0	8.80
1	Icicle	2.0	0.0	--	0	6/8	205.8	34.43
2	Icicle	13.5	0.0	--	0	6/6	204.0	17.04
3	Icicle	10.0	0.0	--	0	6/7	206.0	30.69
4	Icicle	--	1.5	--	0	6/11	204.3	17.98
1	Windham	3.8	0.0	--	0	6/5	204.3	18.72
2	Windham	50.0	7.5	6/13	348	6/8	205.3	33.88
3	Windham	40.0	0.5	--	0	6/8	203.3	29.83
4	Windham	--	10.0	--	0	6/11	208.5	26.90
1	WyoWinter	88.8	0.0	--	0	6/5	204.5	25.45
2	WyoWinter	97.3	6.8	6/15	495	6/5	205.3	27.82
3	WyoWinter	94.5	0.0	--	0	6/8	204.5	19.28
4	WyoWinter	--	34.3	6/17	761	6/10	208.3	27.64
Mean		42.1	12.5	6/15	255.8	6/8	205.1	25.2
C.V. (%)		22.5	99.1	1.1	168.7	0.7	0.8	25.3
Planting Date (PD)		<.0001	<.0001	0.2924	0.0025	<.0001	0.002	0.0069
Variety (V)		<.0001	<.0001	0.7389	0.0022	0.0063	0.24	0.407
PD x V		<.0001	<.0004	0.911	0.1384	<.0001	0.0015	<.0001

In favorable years, such as 2023, PD3 proved to be the most productive planting date, with Blaze and Icicle achieving the highest grain yields. However, Icicle demonstrated poor winter survival followed by Windham. Overall, PD2 and PD3 were the most reliable planting dates for winter peas, with Blaze and WyoWinter emerging as the relatively consistent variety across all planting dates. These findings emphasize the importance of optimizing planting time and variety selection while exploring strategies to maximize the potential of spring-emerging systems. Further research is needed to develop even more winter-hardy cultivars to mitigate the risk of winterkill and improve the resilience of winter peas in extreme weather conditions.