

Abiotic and Biotic Factors Influencing Quality and Quantity within Brassicaceae Using Various Planting Methods in High Tunnels

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INTRODUCTION

Farmers faced with the need to extend their growing season have turned to High Tunnels for off-season crop production. Understanding factors such as planting methods, proper irrigation and temperature profiles, could move farmers toward year round crop production. The importance of this project was to find an efficient way for farmers to extend their harvest season; therefore, providing continuous income outside the normal harvest season. Different planting methods, planting dates, irrigation methods for *Brassica rapa* var. *chinensis* production in high tunnels were explored in this research.

OBJECTIVES

- **Determine which planting method produces better germination.**
- **Determine an optimal timeline for sowing.**
- **Determine which will yield the most biomass.**

MATERIALS & METHODS

- Land preparation: roto tilling the soil into mounds, then raking into level raised beds.
- Random block design: each block (or high tunnel) contained a row (R1) and a replicate (R2), with four high tunnels, totaling eight rows (all replicates of each other).
- Six plants occupied each section. Each treatment was seeded by hand, two seeds were placed in each slot as a redundant measure in both float bed and direct sow.
- T-tape was utilized for irrigation. After plants were mature, they were harvested by hand.
  - The produce harvested was immediately weighed, for fresh weight.
  - 10g samples from each treatment replication were dehydrated to get a dry weight.

Figure 1. The Kentucky State University High Tunnels on south campus.

Figure 2: T-tape irrigation inside high tunnels.

Figure 3: Float bed germination.

Figure 4: Young Chinese cabbage plants.

Figure 5: Mature Chinese cabbage plants.

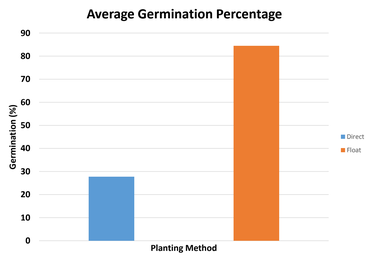

Figure 6: Average germination (%) of Chinese cabbage for direct sow and float bed.

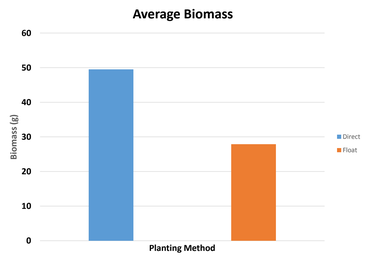

Figure 7: Average biomass of Chinese cabbage for direct sow and float bed.

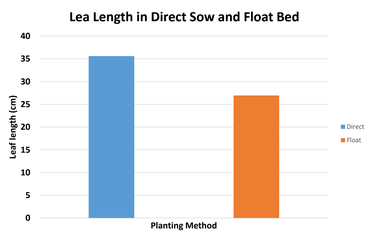

Figure 8: Leaf length of Chinese cabbage in direct sow and float bed.

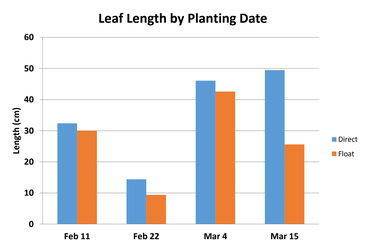

Figure 9: Leaf length in Chinese cabbage in different planting dates.

	Float bed	Direct sow
Mean	84.36	27.73
N	32	32
P-value (1 way Randomized Blocks)	0.000***	

Table 1: Average germination percentage of Chinese cabbage in float bed and direct sow

	Float bed	Direct sow
Mean	49.67	28.31
N	30	31
P-value (1 way Randomized Blocks)	0.0197*	

Table 2: Average biomass of Chinese cabbage in float bed and direct sow

	Float bed	Direct sow
Mean	35.97	27.47
N	30	31
P-value (1 way Randomized Blocks)	0.0385*	

Table 3: Leaf length of Chinese cabbage in float bed and direct sow

	Feb 11	Feb 22	Mar 4	Mar 15
Mean	31.21	11.93	44.25	37.55
N	16	14	15	16
P-value (1 way Randomized Blocks)	0.0000***			

Table 4: Leaf length of Chinese cabbage in different planting dates

RESULTS & DISCUSSION

- Data analyzed using Bartlett's Test, to test the homogeneity of variances, an assumption of ANOVA ($p < .05$ to be significant).
- Germination rate was significantly higher in the float bed compared to direct sow ($p = .0000$ ***).
  - There was no significant difference ($p=0.92$ ns) in germination in terms of planting date.
- Biomass yield showed the differences between direct sow and float bed planting methods were statistically significant ($p = .0197$ *). The mean biomass in direct sow was 49.672 g compared to 28.311 g in the float bed.
  - Direct sow produced nearly double the biomass than float bed. But, biomass by planting date had no significant difference ($p=0.1795$ ns).
- Leaf length difference between direct sow and float bed was significant ($p=0.0385$ *).

CONCLUSIONS

- Float bed germination was significantly higher than direct sow germination.
- There was no significance with data to determine optimal sowing date.
- Direct sow planting method yielded significantly more biomass.

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