Thesis Summary – Wheat – LPU – India 2024

Time

- Date of Sowing: 08/11/2023
- Samples and photos taken at: 45 DAS (Days After Seeding), 60 DAS, 90 DAS, and at final harvest ~120 DAS.

Location

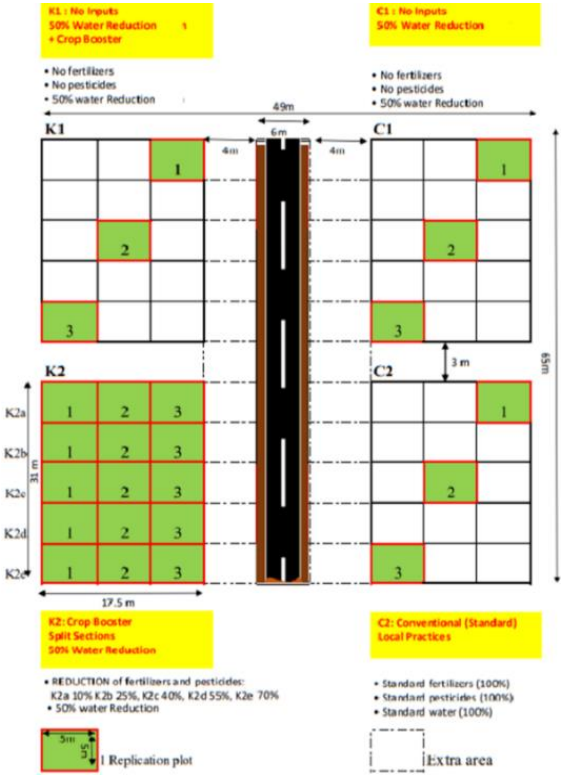
- Lovely Professional University, Panjab, Northern India
- Their experimental field is at Jalandhar, Punjab, India

Purpose

To verify the effect of Kyminasi Plants/Crop Booster (KPCB) on wheat growth and yield, using Harvest Harmonics' POPS (Profitability Optimization Protocol for Sustainability) program.

Details

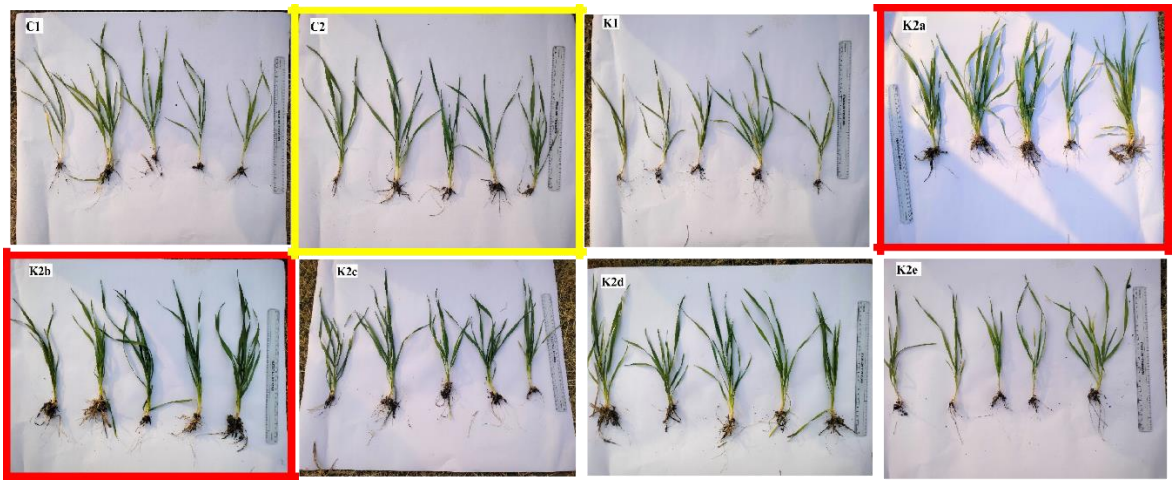
- Conducted by: Prof. Chandra Mohan Mehta
- Crop: Wheat
- Variety: PBW 826
- Fertilizer application: split dosages, dry
- Irrigation type: flood
- No. of irrigation done: five (5)
- Field layout: per POPS, with a matrix of 3x5 plots in each field, with a road separation and three (3) replications
- In this layout, four (4) fields were set up, namely K1, C1, K2, and C2
  - C1: no fertilizers, 50% reduction in water
  - C2: Conventional (Standard)
  - K1: KPCB + No fertilizers
  - K2a: KPCB + 10% reduction of fertilizers
  - K2b: KPCB + 25% reduction of fertilizers
  - K2c: KPCB + 40% reduction of fertilizers
  - K2d: KPCB + 55% reduction of fertilizers
  - K2e: KPCB + 75% reduction of fertilizers.



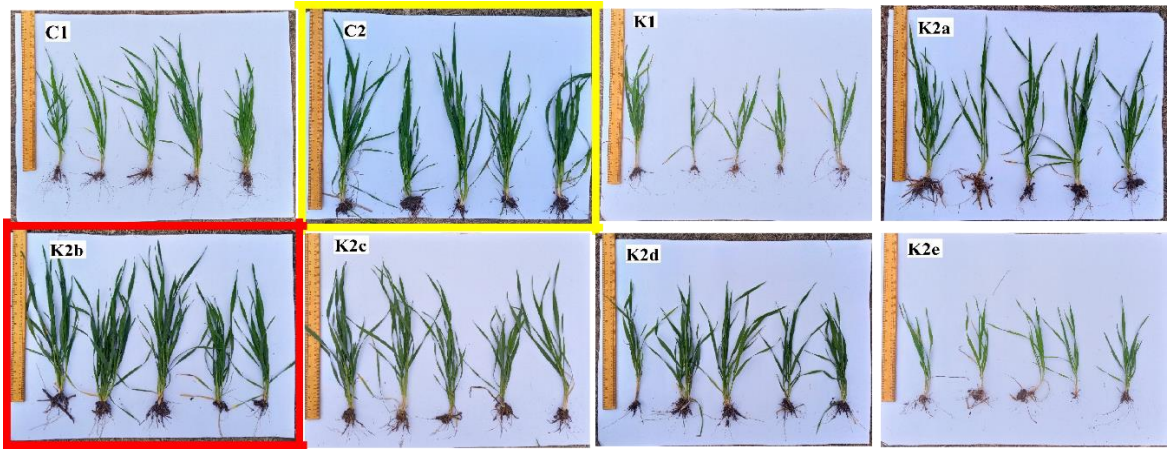
Results

The photos below show the different level of tiller development under the various input conditions.

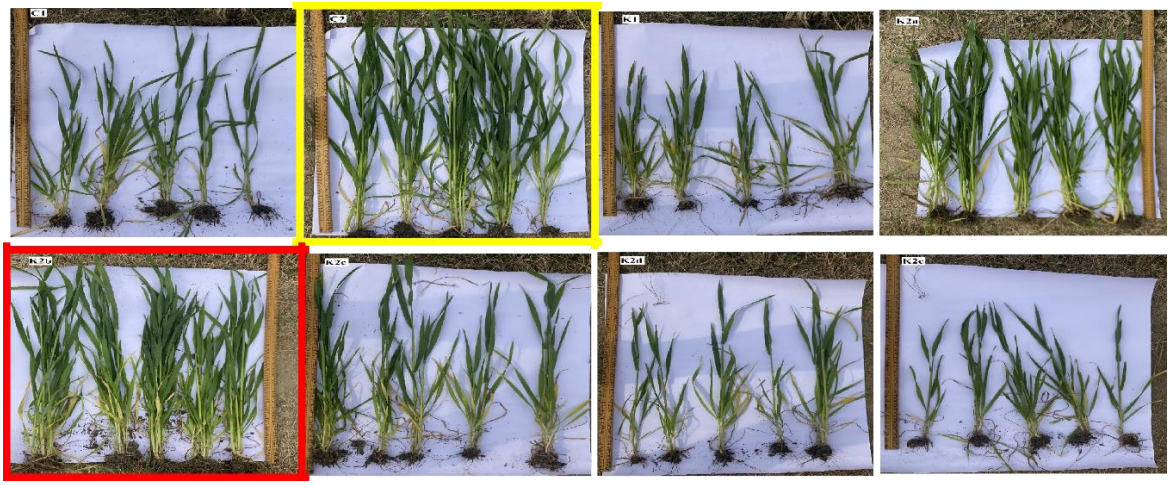
Tillering, 45 DAS



Tillering, 60 DAS

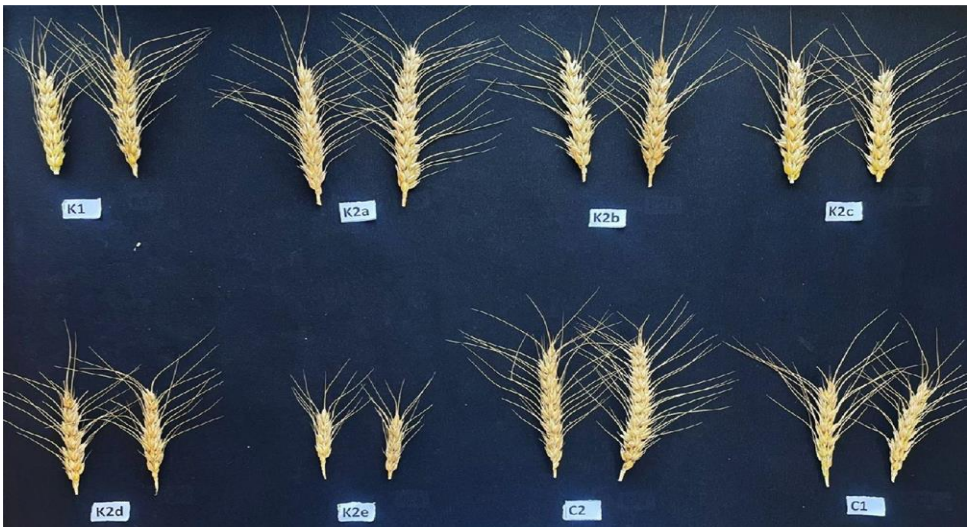


Tillering, 90 DAS



Wheat Spikes, Grain Filling Stage

Wheat Spikes, Maturity Stage



Plant and Root Samples, Maturity Stage

Harvest Samples

Final Yield

Yield Results Analysis

Prof. Mehta chose a standard water reduction of 50% and found out that further reductions of chemicals in the 25%-55% range resulted in better yields, greener leaves and thicker root systems.

The following section provides our POPS Cost-Benefit Analysis, that can vary from grower to grower according to their sustainability goals. The grower may focus on saving water, saving chemical inputs, a combination of these savings, or simply go for the highest yield.

POPS Science Trial Reducing Fertilizers and Pesticides Use in Wheat – While Saving 30% on Water

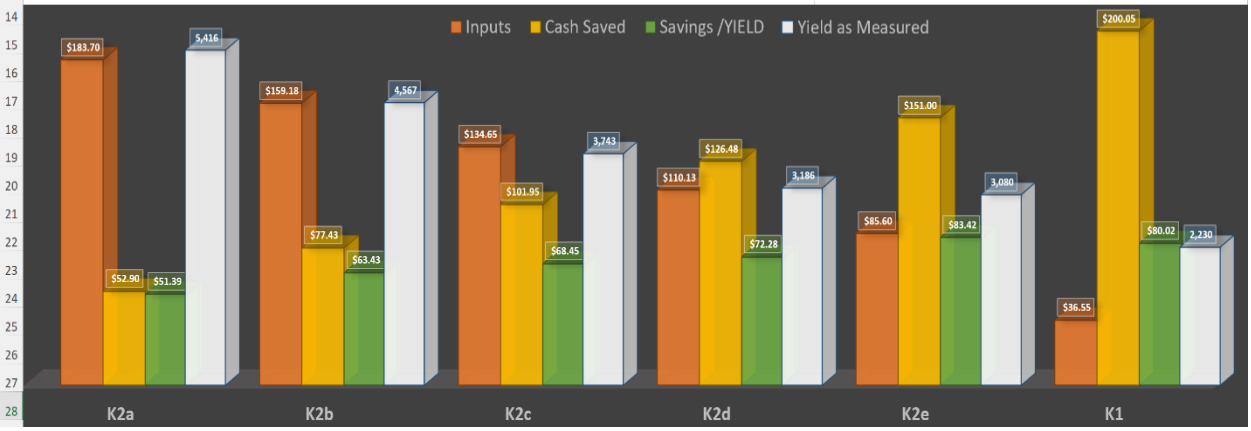
The calculations below are exemplary cost-benefit analysis, presented for discussion purposes only. In this calculation, the results were taken from the trial done by Lovely Professional University in India, and the costs of inputs are typical to the USA.

Profitability Optimization Protocol for Sustainability (POPS) Calculator

Yield and Growth Statistics by Prof. Chandra Mohan Mehta, Lovely Professional University (LPU) India 2004 Final Harvest Report

Water & fertilizer costs: USA average, used for discussion purposes only

Plot	Fertilizer reduc.	Fertilizer/ acre cost	Water reduc.	Water/ acre cost	Total $$ inputs	Yield: Amount Measured	Yield: Sustainable Value	Yield: Gain (Over Conrol)	Yield: Gain (Evaluated)	Spike Length: Amount Measured	Spike Length: Sustainable Value	Spike Length: Gain (Over Conrol)	Spike Length: Gain (Evaluated)	No. of Grains Per Spike: Amount Measured	No. of Grains Per Spike: Sustainable Value	No. of Grains Per Spike: Gain (Over Conrol)	No. of Grains Per Spike: Gain (Evaluated)	Test Weight: Amount Measured	Test Weight: Sustainable Value	Test Weight: Gain (Over Conrol)	Test Weight: Gain (Evaluated)	CASH $$ saved	Extra $$ /YIELD
		$ 163.50	50%	$ 73.10	$ 236.60		100%				55%				65%				60%				
C2	0%	$ 163.50	0%	$ 73.10	$ 236.60	5,575	5,575	0%	0%	14.92	14.92	0%	0%	55.29	55.29	0%	0%	44.69	44.69	0%	0%		
K2a	10%	$ 147.15	50%	$ 36.55	$ 183.70	5,416	6,976	25%	25%	7.78	10.02	-33%	-18%	26.47	34.09	-38%	-25%	30.45	39.22	-12%	-7%	$ 52.90	$ 51.39
K2b	25%	$ 122.63	50%	$ 36.55	$ 159.18	4,567	6,788	22%	22%	12.12	18.02	21%	11%	52.06	77.38	40%	26%	44.70	66.44	49%	29%	$ 77.43	$ 63.43
K2c	40%	$ 98.10	50%	$ 36.55	$ 134.65	3,743	6,577	18%	18%	16.10	28.29	90%	49%	52.35	91.99	66%	43%	42.24	74.22	66%	40%	$ 101.95	$ 68.45
K2d	55%	$ 73.58	50%	$ 36.55	$ 110.13	3,186	6,845	23%	23%	8.00	17.19	15%	8%	39.41	84.67	53%	35%	33.40	71.76	61%	36%	$ 126.48	$ 72.28
K2e	70%	$ 49.05	50%	$ 36.55	$ 85.60	3,080	8,513	53%	53%	6.00	16.58	11%	6%	43.53	120.32	118%	76%	39.78	109.95	146%	88%	$ 151.00	$ 83.42
K1	100%	$ -	50%	$ 36.55	$ 36.55	2,230	14,436	159%	159%	6.00	38.84	160%	88%	43.53	281.78	410%	266%	39.78	257.51	476%	286%	$ 200.05	$ 80.02



Interpreting the results depends on the sustainability goal:

- **Maximum yield,** represented by the white columns in the graph, was obtained in plot K2a: KPCB with 50% reduction in water and 10% reduction of fertilizers.
- **Maximum cash savings** (yellow columns) was achieved in plot K1: KPCB with 50% reduction in water and without fertilizers.
- **Optimal savings/yield combination per acre** (green columns) were obtained in plot K2e: KPCB with 50% reduction in water and 10% reduction of fertilizers.

Conclusions

This study has shown two aspects of using KPCB technology from Harvest Harmonics:

1. KPCB enhances wheat growth while saving on inputs and water. Large scale implementation is postulated to save India billions of Rupees.
2. Local farmers should perform the POPS program developed by Harvest Harmonics in order to find THEIR optimum inputs to reach their sustainability goals.

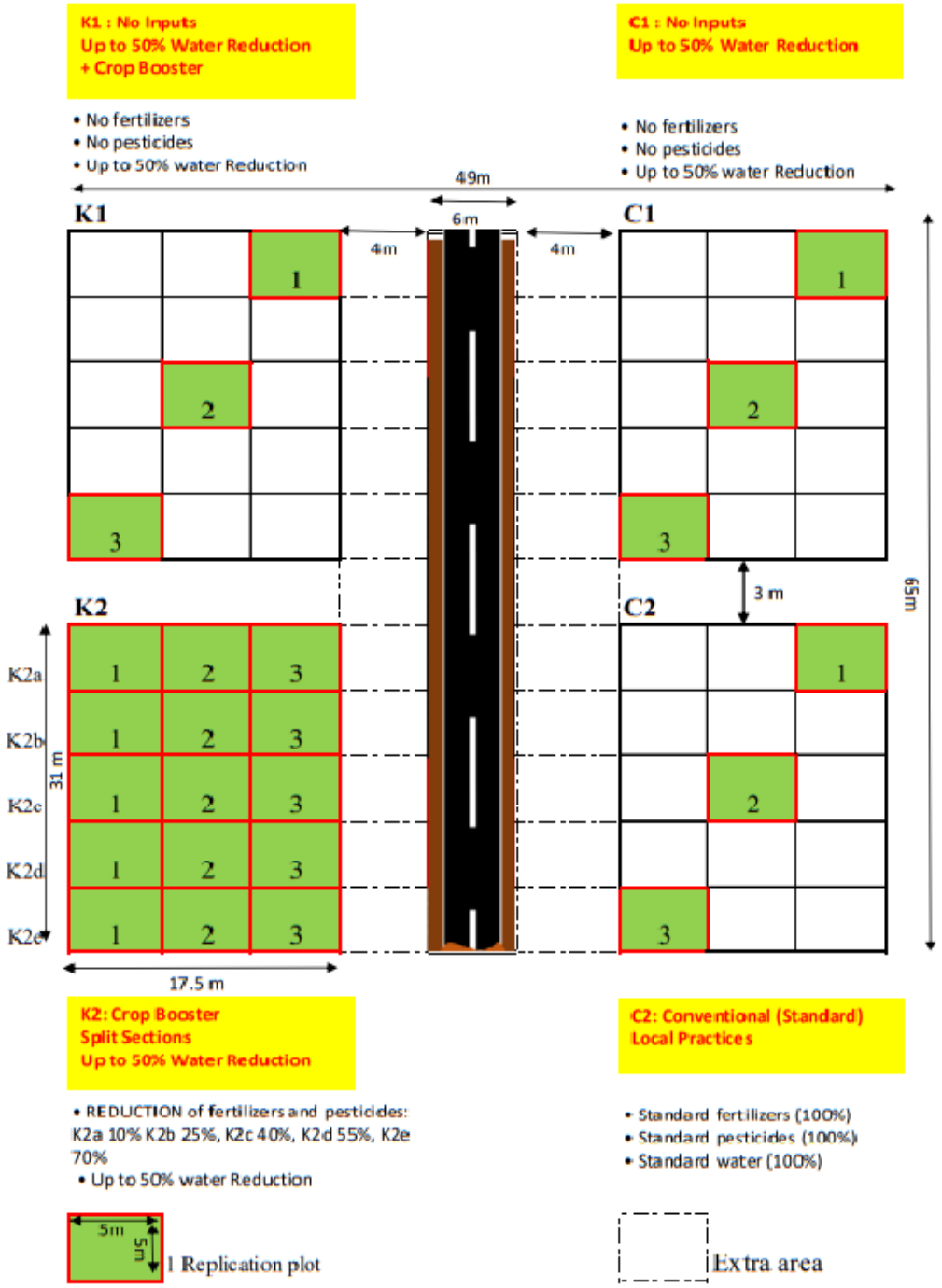
Effect of Crop Booster on Wheat Crop

Prof. Chandra Mohan Mehta

Treatment Details

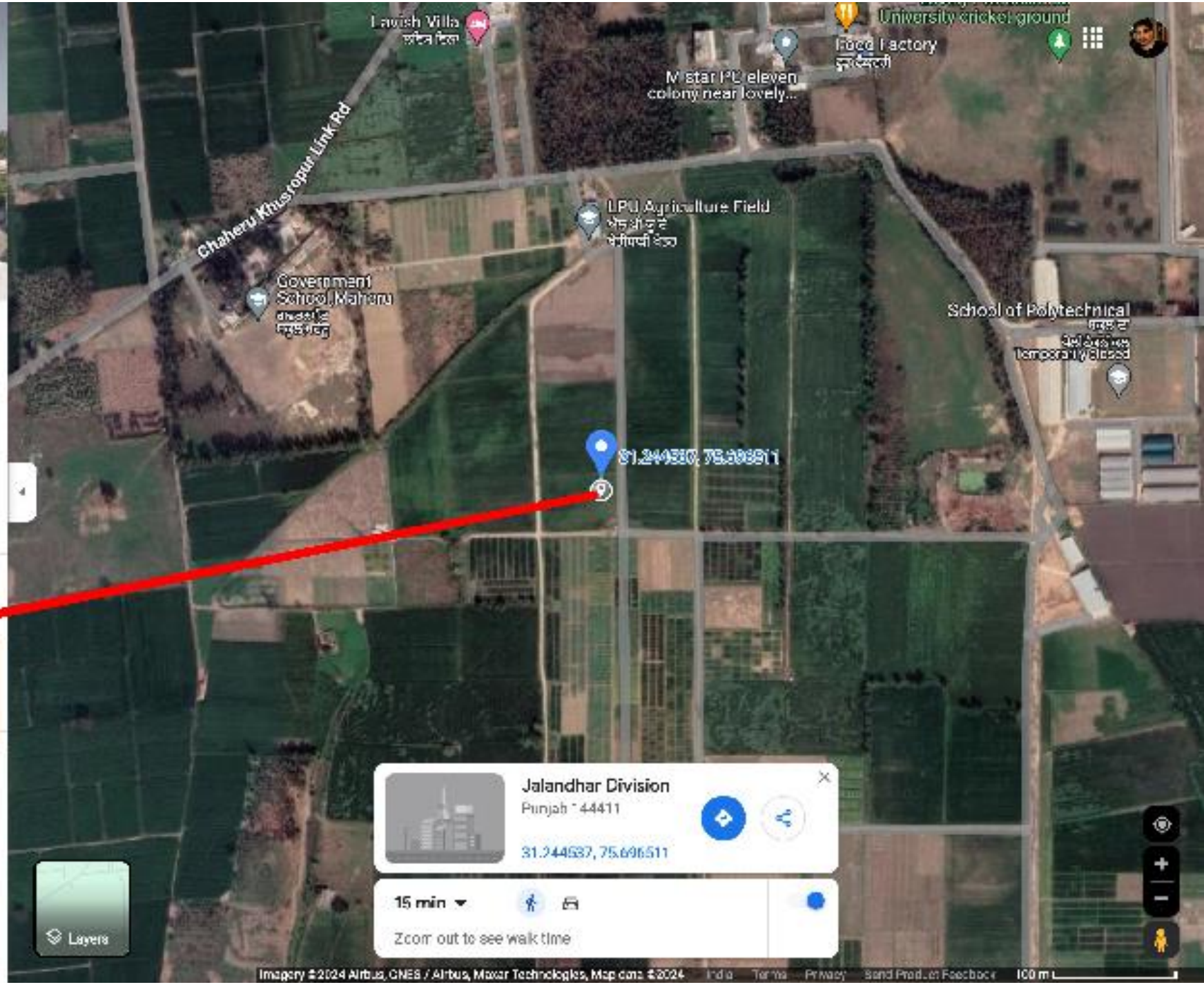
C1	**No fertilizers**
C2	**Conventional (Standard) RDF (100)**
K1	**Crop Booster + No fertilizers**
K2a	**Crop Booster + 10% Reduction of fertilizers**
K2b	**Crop Booster + 25% Reduction of**
K2c	**Crop Booster + 40% Reduction of fertilizers**
K2d	**Crop Booster + 55% Reduction of fertilizers**
K2e	**Crop Booster + 75% Reduction of fertilizers**

Layout

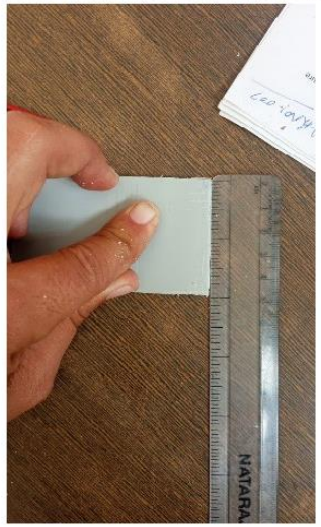

K1 : No Inputs
Up to 50% Water Reduction
+ Crop Booster
• No fertilizers
• No pesticides
• Up to 50% water Reduction
C1 : No Inputs
Up to 50% Water Reduction
• No fertilizers
• No pesticides
• Up to 50% water Reduction
49m
6 m
4m
4m
K1
C1
K2
C2
3 m
65m
K2a
K2b
K2c
K2d
K2e
31 m
17.5 m
K2: Crop Booster
Split Sections
Up to 50% Water Reduction
• REDUCTION of fertilizers and pesticides: K2a 10% K2b 25%, K2c 40%, K2d 55%, K2e 70%
• Up to 50% water Reduction
C2: Conventional (Standard)
Local Practices
• Standard fertilizers (100%)
• Standard pesticides (100%)
• Standard water (100%)
5m
5m
1 Replication plot
Extra area

EXPERIMENTAL AREA

31°14'40.1"N 75°41'47.6"E



Installation of Crop Booster



Sowing

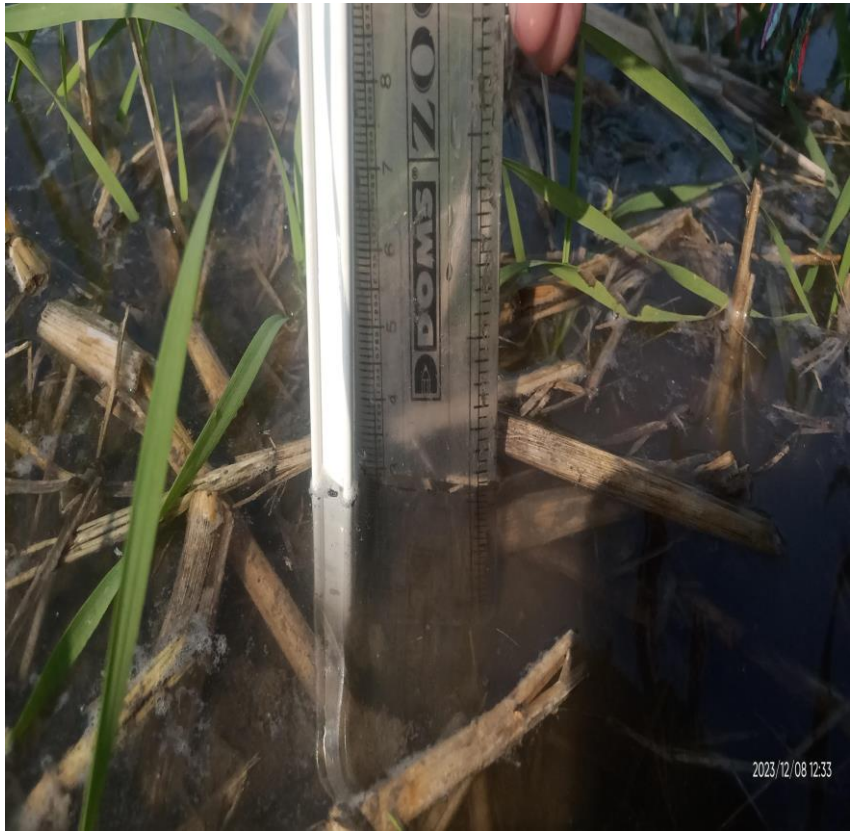
- **Date of Sowing – 08/11/2023**
- **Variety - PBW 826**

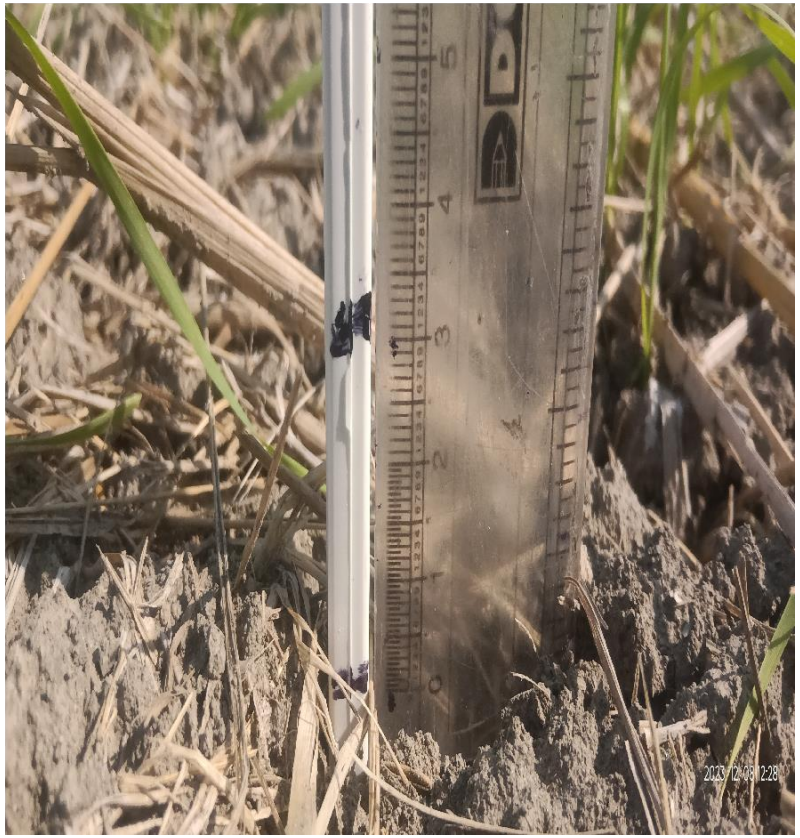
Fertilizer application

- **Fertilizer application – Split Dosages**

Irrigation

No. of irrigation done – 5

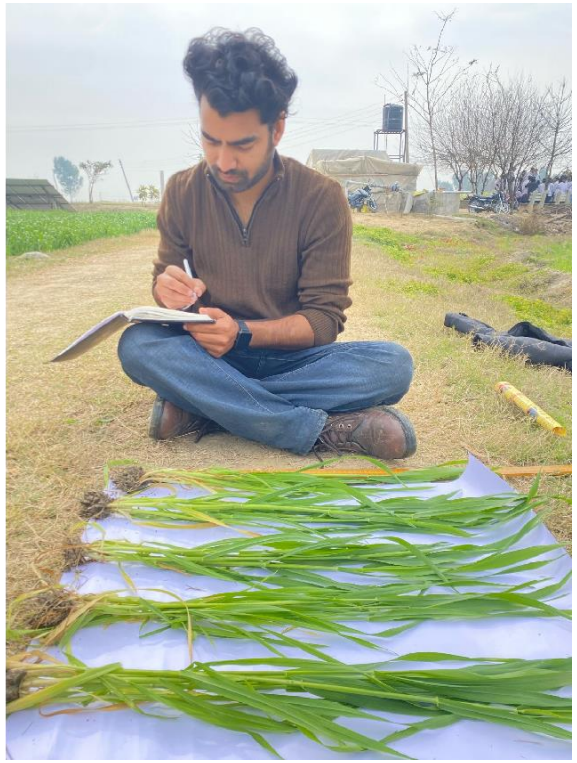




Data Collection at Vegetative stages

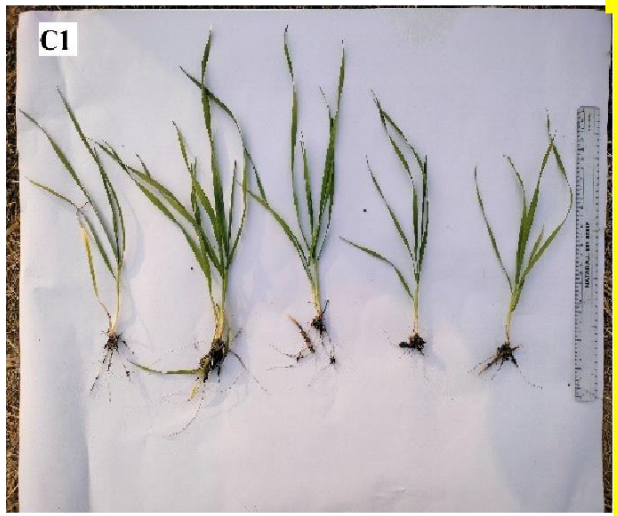
45 DAS

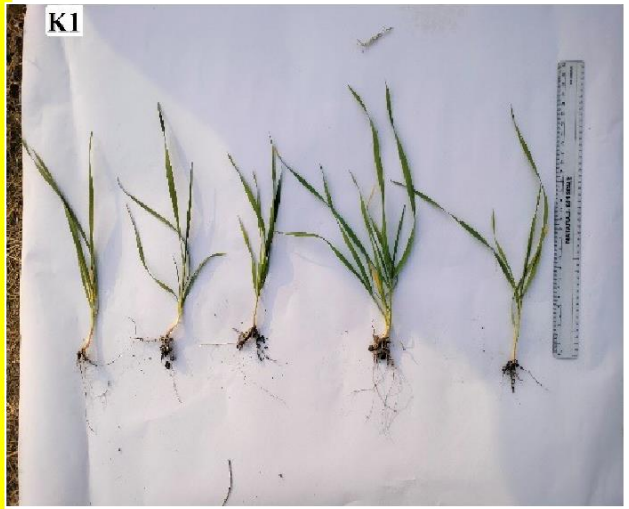
60 DAS

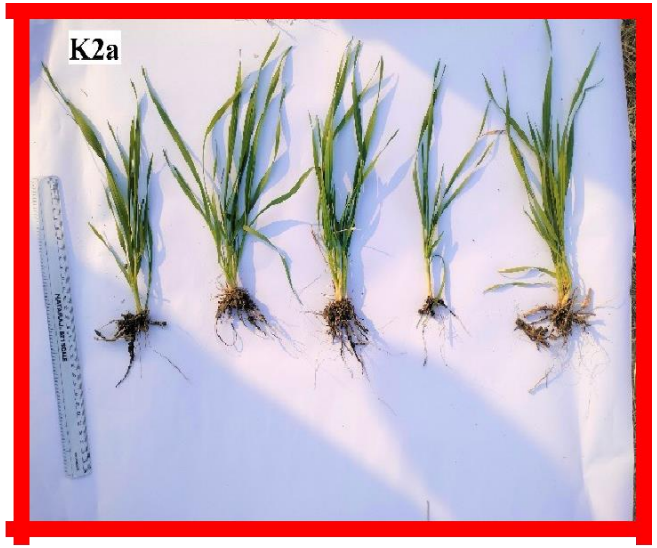


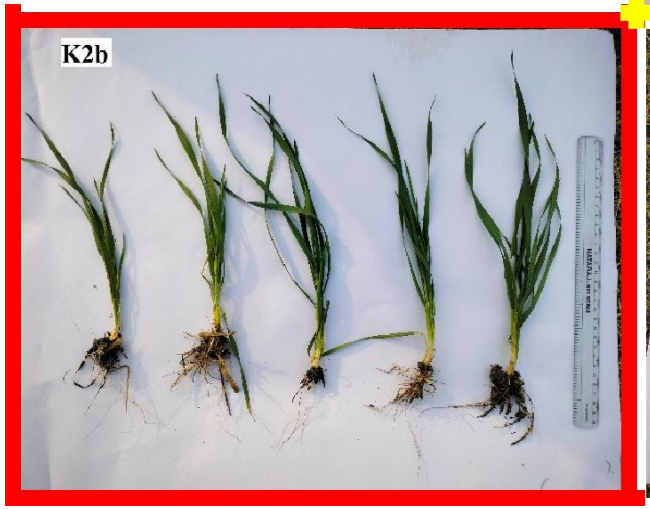
90 DAS

Results (45 DAS)

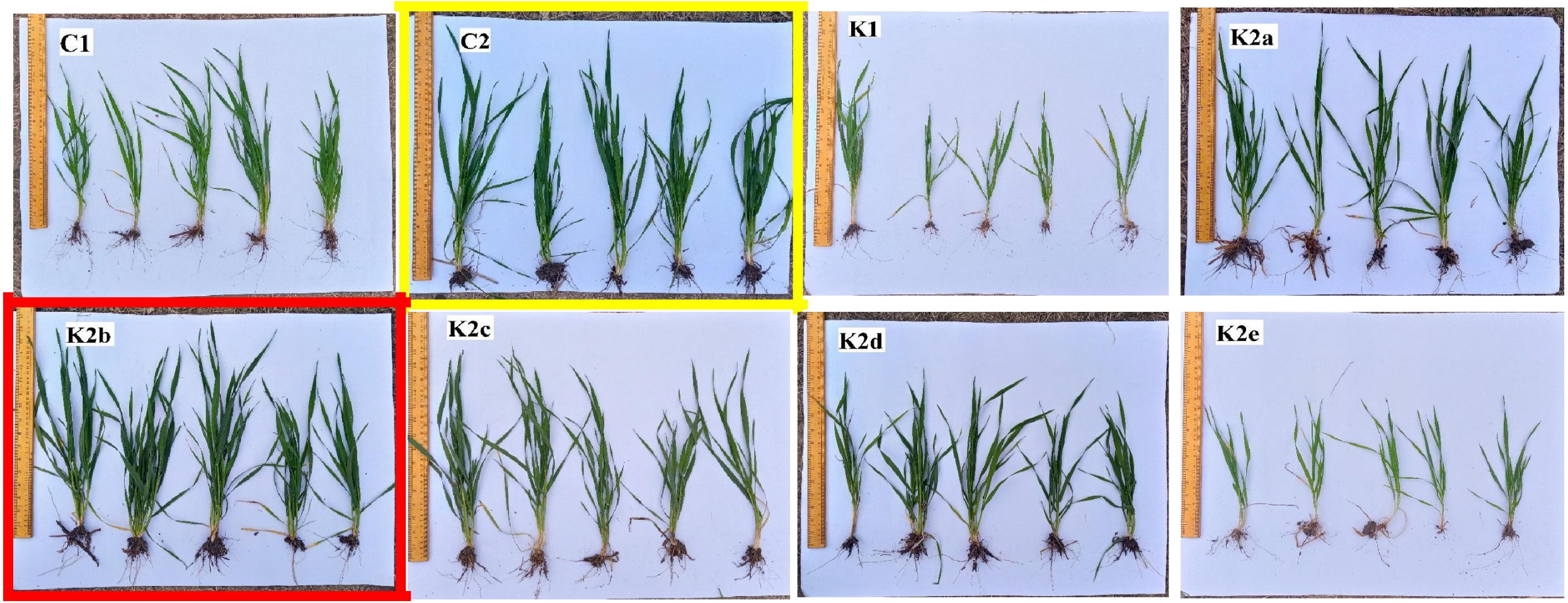




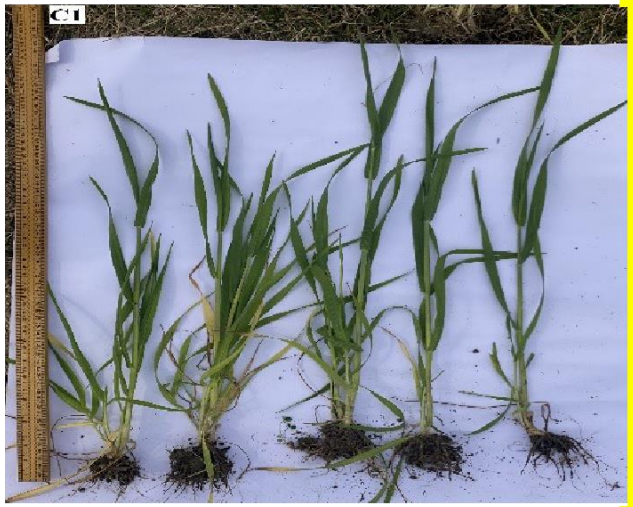


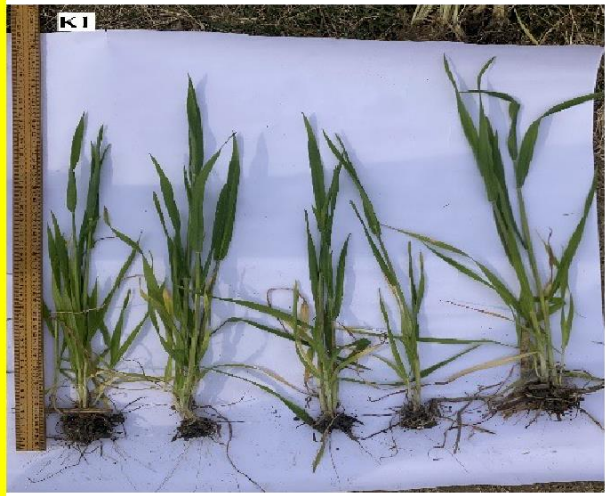


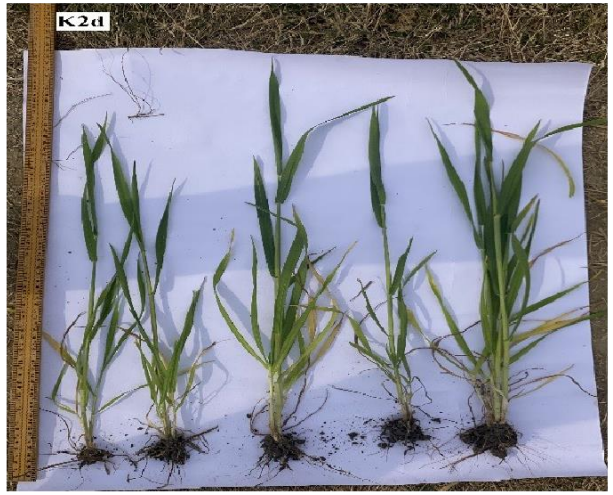
Results (60 DAS)



Results (90 DAS)








C1
C2
K1
K2a
K2b
K2c
K2d
K2e

Insect/pest incidence

Common Name - Ladybird beetle

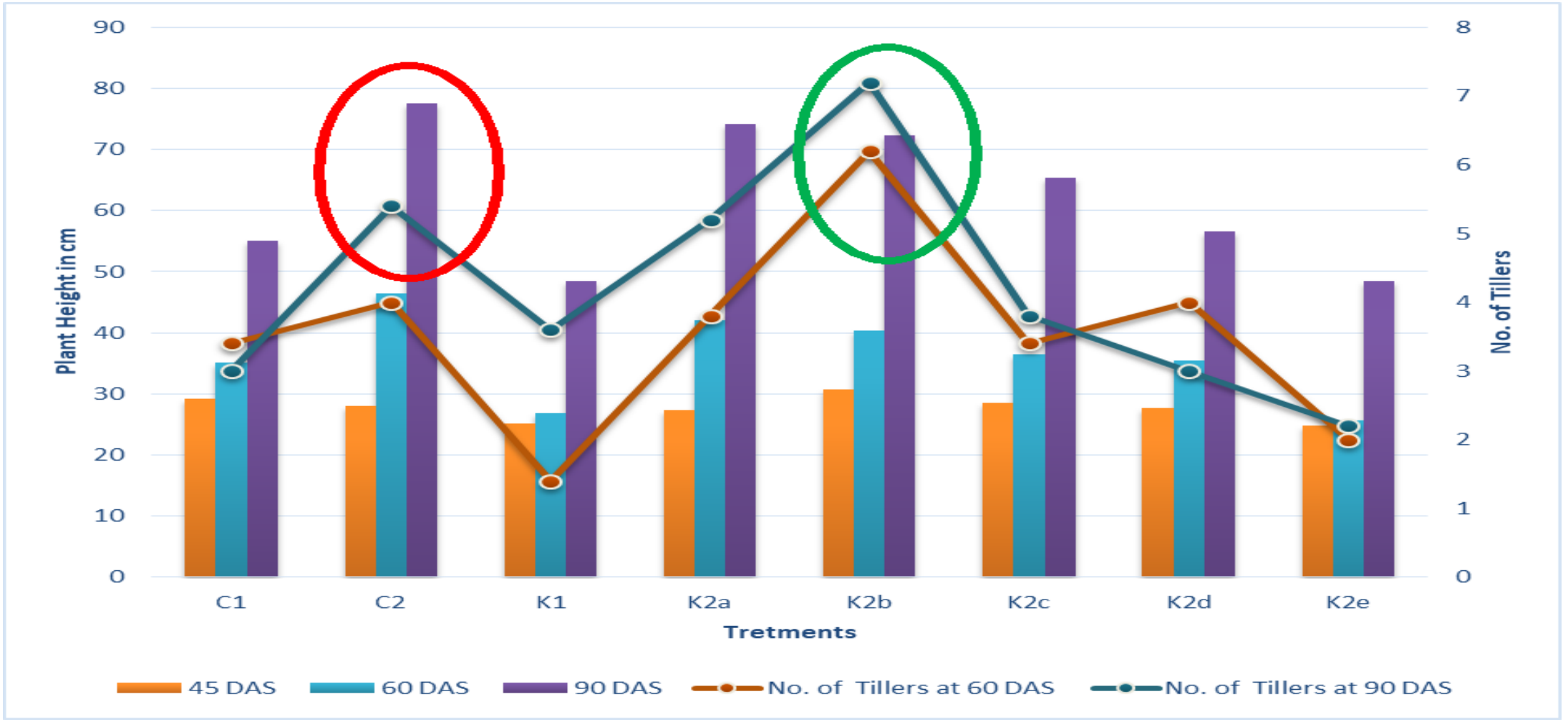
Scientific Name - *Cocinela septumpunctata*

Common Name - Bird cherry-oat aphid

Scientific Name - *Rhopalosiphum padi*

Common Name - English grain aphid

Scientific Name - *Sitobion avenae*

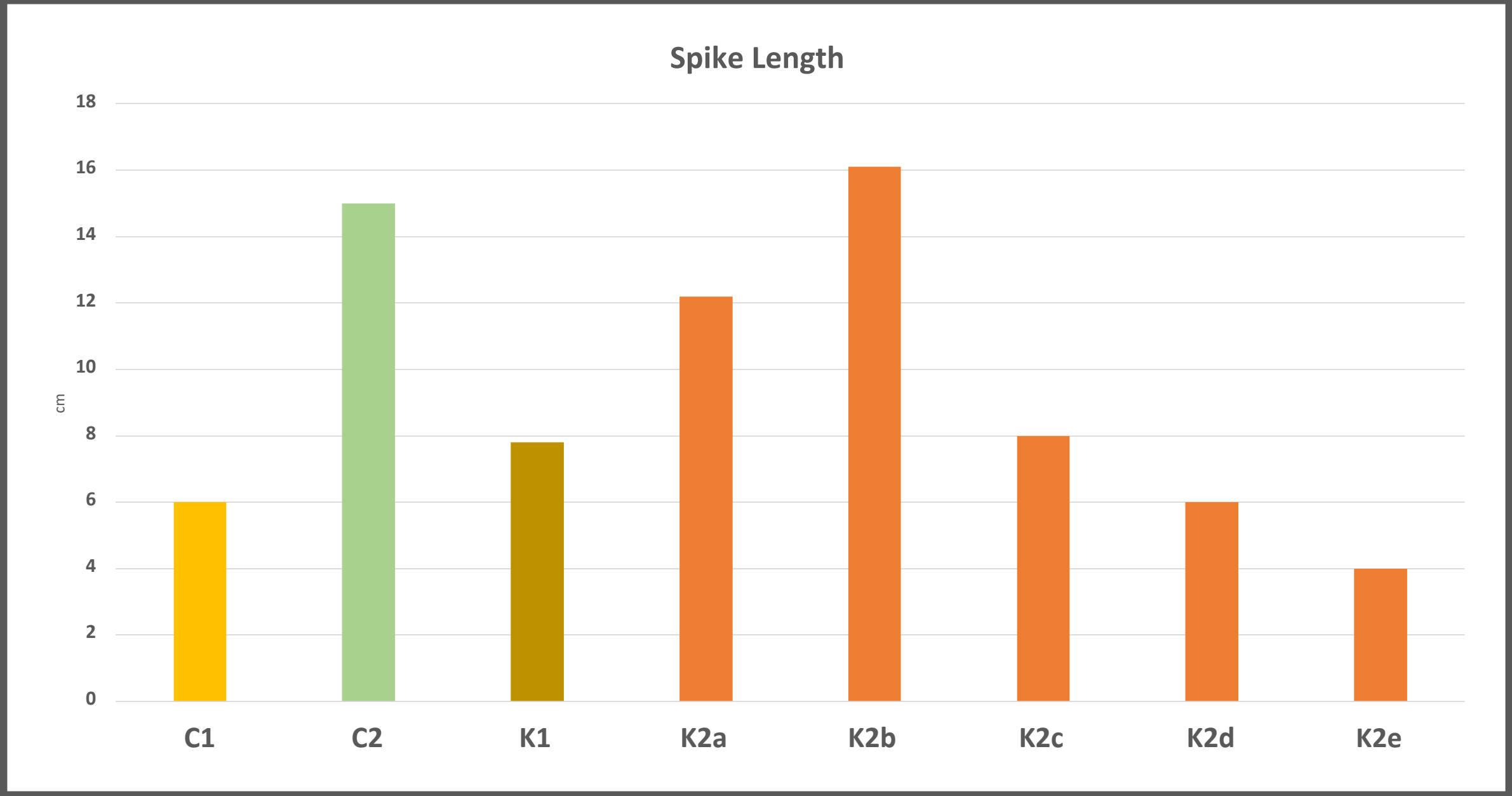


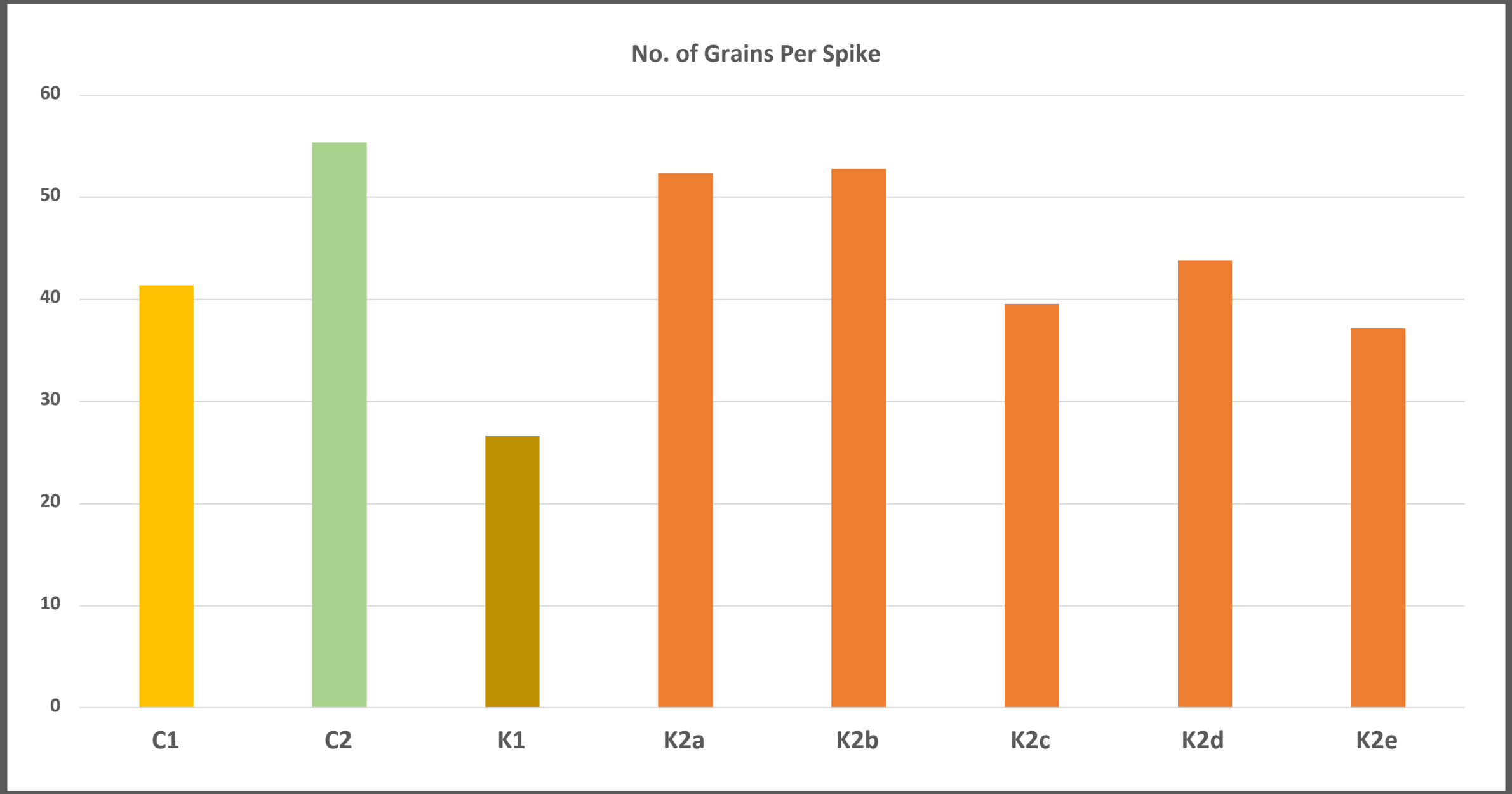
C1	**No fertilizers, No pesticides, 50% Water Reduction**
C2	**C2: Conventional (Standard) Local Practices, Standard fertilizers (100%),Standard pesticides (100%) Standard water (100%)**
K1	**Crop Booster + No fertilizers, No pesticides, 50% Water Reduction**
K2a	**Crop Booster + 10% Reduction of fertilizers and pesticides, 50% Water Reduction**
K2b	**Crop Booster + 25% Reduction of fertilizers and pesticides, 50% Water Reduction**
K2c	**Crop Booster + 40% Reduction of fertilizers and pesticides, 50% Water Reduction**
K2d	**Crop Booster + 55% Reduction of fertilizers and pesticides, 50% Water Reduction**
K2e	**Crop Booster + 75% Reduction of fertilizers and pesticides, 50% Water Reduction**

Data Collection at Maturity stage

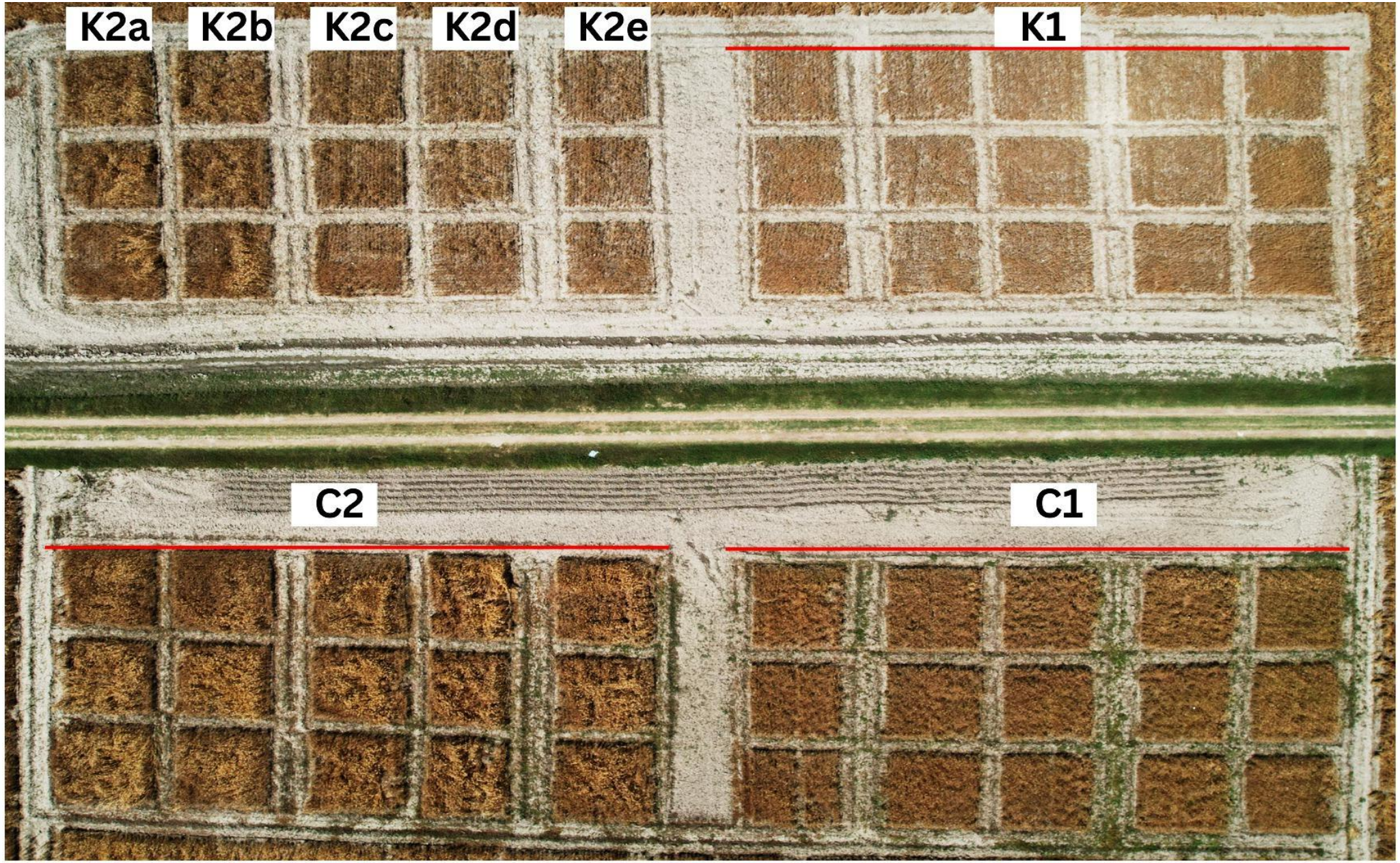

K1
K2a
K2b
K2c
K2d
K2e
C2
C1


C1
C2
K1
K2A
K2B
K2C
K2D
K2E

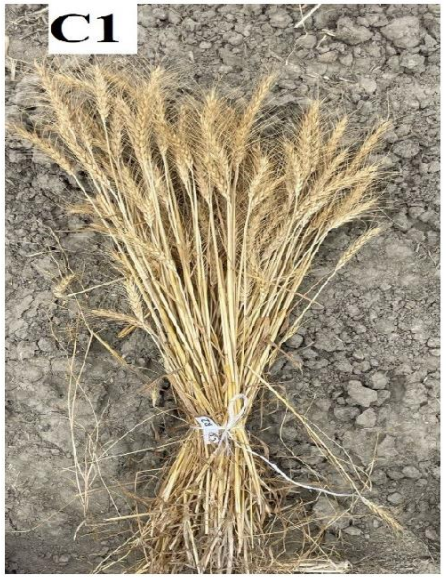

Spike Length
18
16
14
12
10
8
6
4
2
0
cm
C1
C2
K1
K2a
K2b
K2c
K2d
K2e


No. of Grains Per Spike
60
50
40
30
20
10
0
C1
C2
K1
K2a
K2b
K2c
K2d
K2e

Drone Image (Prior to Harvest)

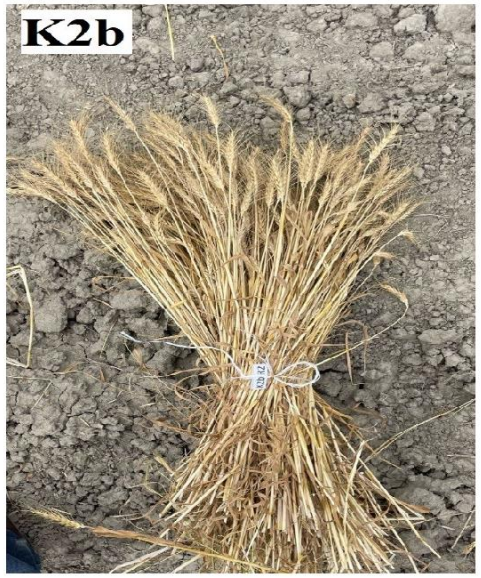


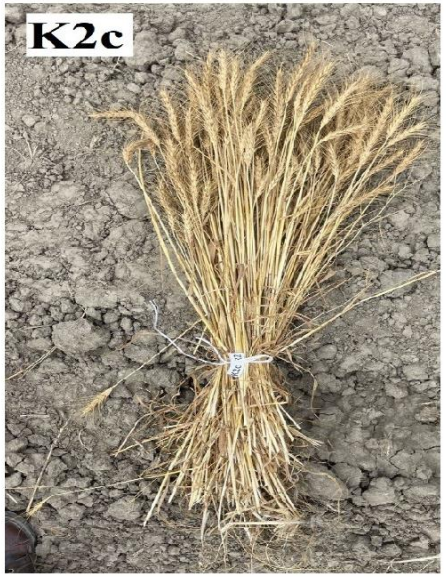

K1

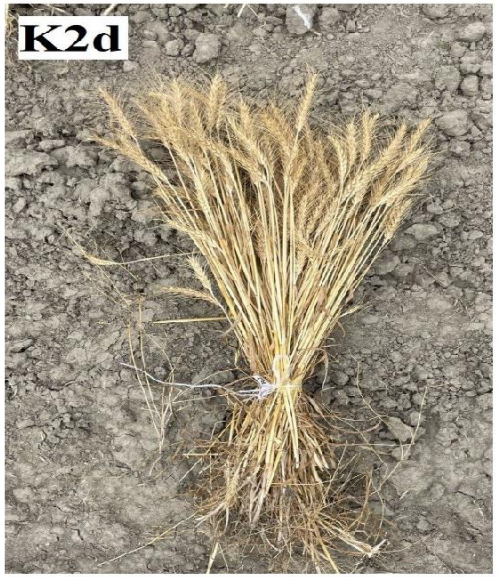

C1


C2

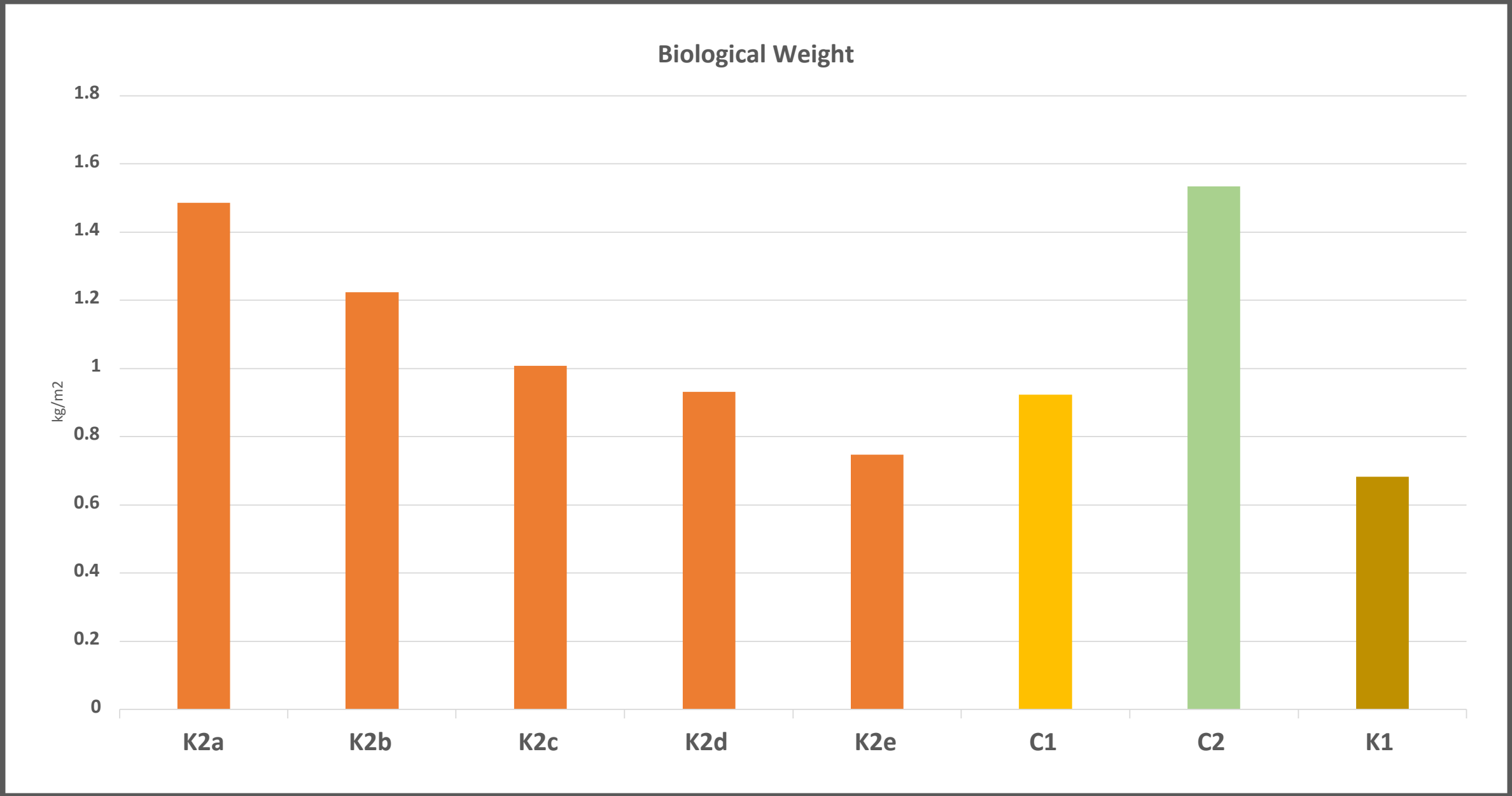

K2a


K2b

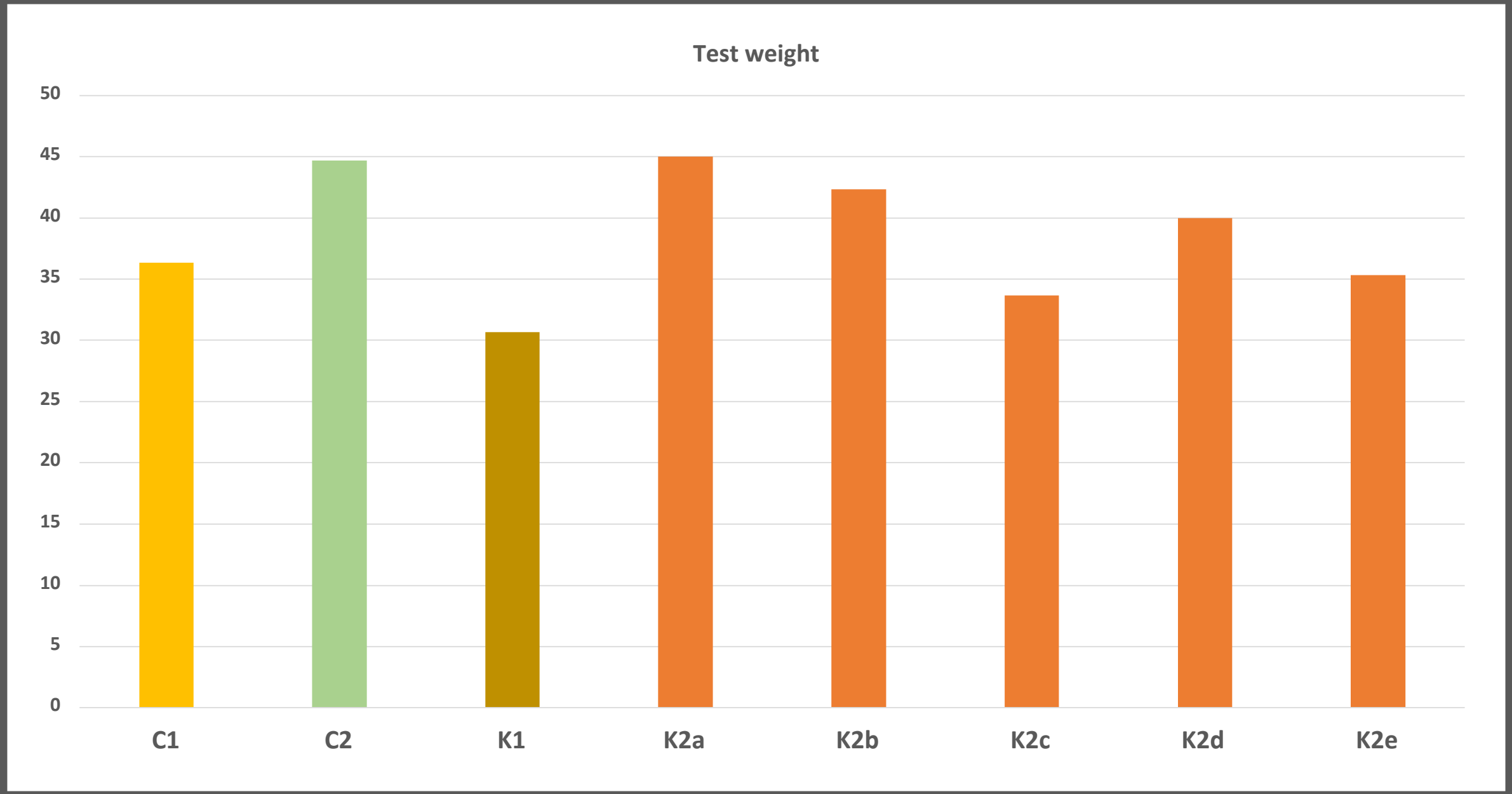

K2c

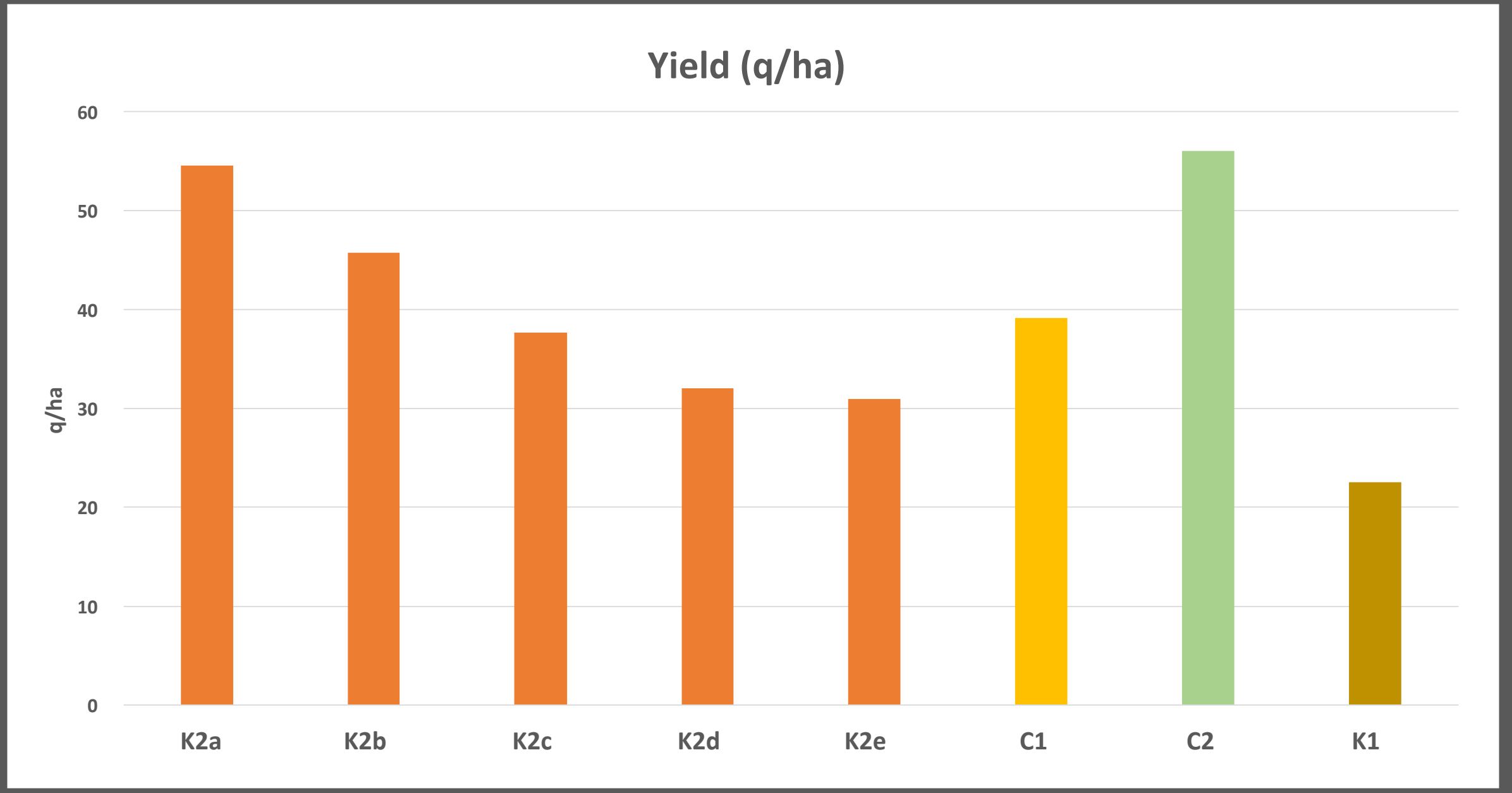

K2d


K2e


Biological Weight
1.8
1.6
1.4
1.2
1
0.8
0.6
0.4
0.2
0
kg/m2
K2a
K2b
K2c
K2d
K2e
C1
C2
K1


K1
C1
C2
K2A
K2B
K2C
K2D
K2E


Test weight
50
45
40
35
30
25
20
15
10
5
0
C1
C2
K1
K2a
K2b
K2c
K2d
K2e


Yield (q/ha)
q/ha
60
50
40
30
20
10
0
K2a
K2b
K2c
K2d
K2e
C1
C2
K1

THANK YOU

NAAC GRADE A++

LOVELY PROFESSIONAL UNIVERSITY PUNJAB (INDIA)

LPU