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Sustainable Agriculture

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Effect of Drought Stress on Mungbean (*Vigna radiata* L.) under Arid Climatic Conditions of Saudi Arabia

Contents:

INTRODUCTION & REVIEW:

- Mungbean was originated from South Asian Subcontinent about 1500 BC and being cultivated in short rainy season in arid and semi arid reigns.

  (AVRDC, 2012; Thomas *et al.,* 2003)

- It's world average yield is 0.4 tons/ha however some Indian Varieties have produced 2.5 tons/ha seed.

  (AVRDC, 2012)

- Fresh or dry Mungbean seed can be used as a whole or may be processed to bread, noodles, porridge, soups, snacks or even ice-cream. Raw Mungbean seeds contain 62.62% carbohydrates, 23.86% proteins, 16.3% dietary fibers, vitamin C, A and minerals (K, P, Mg, Ca).

  (Mogotsi, 2006; USDA, 2011; BBS, 2000)

- It is also a valuable green manure, can produce a huge biomass (7.16 t /ha). It contribute a lot of Nitrogen to soil ranging from 30 to 251 kg/h. Due to its short growth period (3 Months) its being used as cover and intercrop.

  (Hoorman *et al.*, 2009; Devendra *et al.*, 2001)

- Drought is a meteorological term and is commonly defined as a period without significant rainfall.

  (Farooq *et al.*, 2009; Jaleel *et al.,* 2009)

- Severe water stress may result in the arrest of photosynthesis, disturbance of metabolism and finally the death of plant.

  (Manikavelu *et al.,* 2006; Kaya *et al.,* 2006; Hussain *et al.,* 2008; Abdel and Al-Rawi, 2011)

- Use of the drought tolerant species is one of the effecting strategies to cope with water deficit stress wisely. A wise planning of irrigation preferred water use efficiency (WUE) for arid and semi-arid regions has been suggested.

- In the last two years, an attempts to grow Mungbean under Saudi Arabian conditions have been done by Plant Production Department at College of Food and Agriculture Sciences, King Saud University, Kingdom of Saudi Arabia. Preliminary results showed that it can be successfully grown under Saudi Arabian condition as a summer legume crop, therefore systematic research works are needed to identify the most promising variety and the proper agronomic practices recommendations.

  (Alderfasi *et al.,* 2012)

OBJECTIVES:

- More crop per drop
- Selection of high yielding genotypes (HYG).
- Conservation of water (extension of the cultivated area).
- Enrich soil fertility by cultivating summer legume.
- Optimization and promising agronomic practices for Mungbean cultivation under Saudi Arabian conditions.

MATERIALS AND METHODS:

1) Experimental Site:

- Experimental Farm: College of Food and Agriculture Sciences King Saud University
- Location: 24.72^0 N latitude, 46.63^0 E longitude and almost 600m Altitude
- Climate: This region has hot desert climate, extremely hot summer, approaching $50\ ^0C$ occasionally and only 10 to 17 percent humidity. City experienced a very little rainfall and a number of heavy dust storms in summer.

2) Treatments:

Treatments can be summarized as…

Factor	Allocation	Levels	Specification/name	Amount (m3/ha)/ Origin
A (Irrigation)	Main plot	I_1	3 days (control)	12,000
		I_2	5 days	7,200
		I_3	7 days	5,200
		I_4	9 days	4,000
B (Genotypes)	Sub plot	V_1	Kawmay-1	Egypt
		V_2	VC-2010	Thailand
		V_3	King	China

- Experimental design was "Split Plot Design"
- Irrigational intervals was taken as "Main Plot Treatment" which are 4 in number.
- Three Mung bean genotypes was occupy "Subplot" Each replication consist of; 3x4= 12 experimental units.
- Number of replications = 3
- Total number of experimental units = 12x3= 36

3) Statistical Data Analysis:

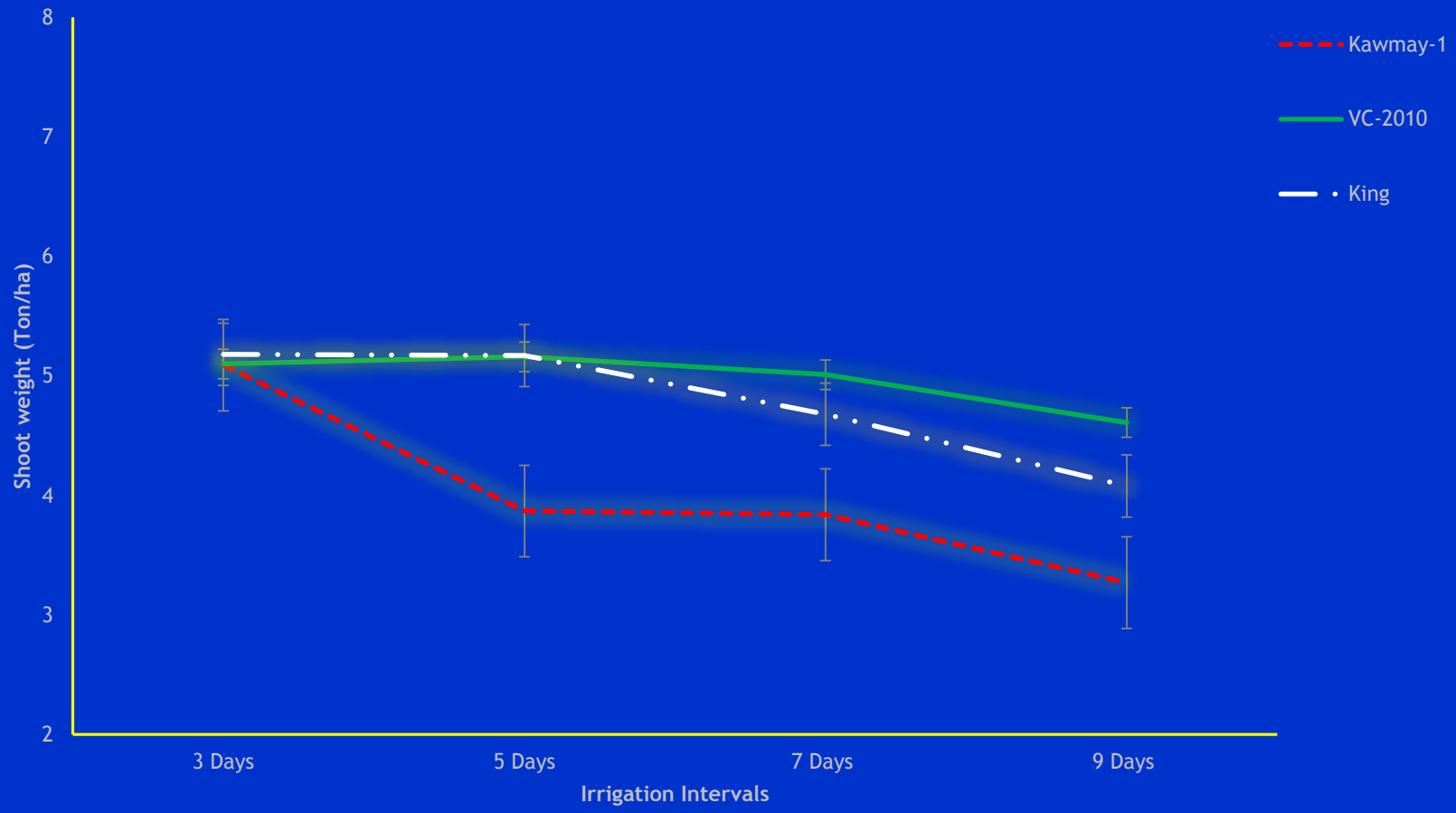
- Statistical analyses was done by using SAS 9.1.3 software.
- Treatments was compared at 5% probability level, Using least significant difference (LSD) according to Steel (1997). (Steel *et al.*, 1997)

Results and Discussion

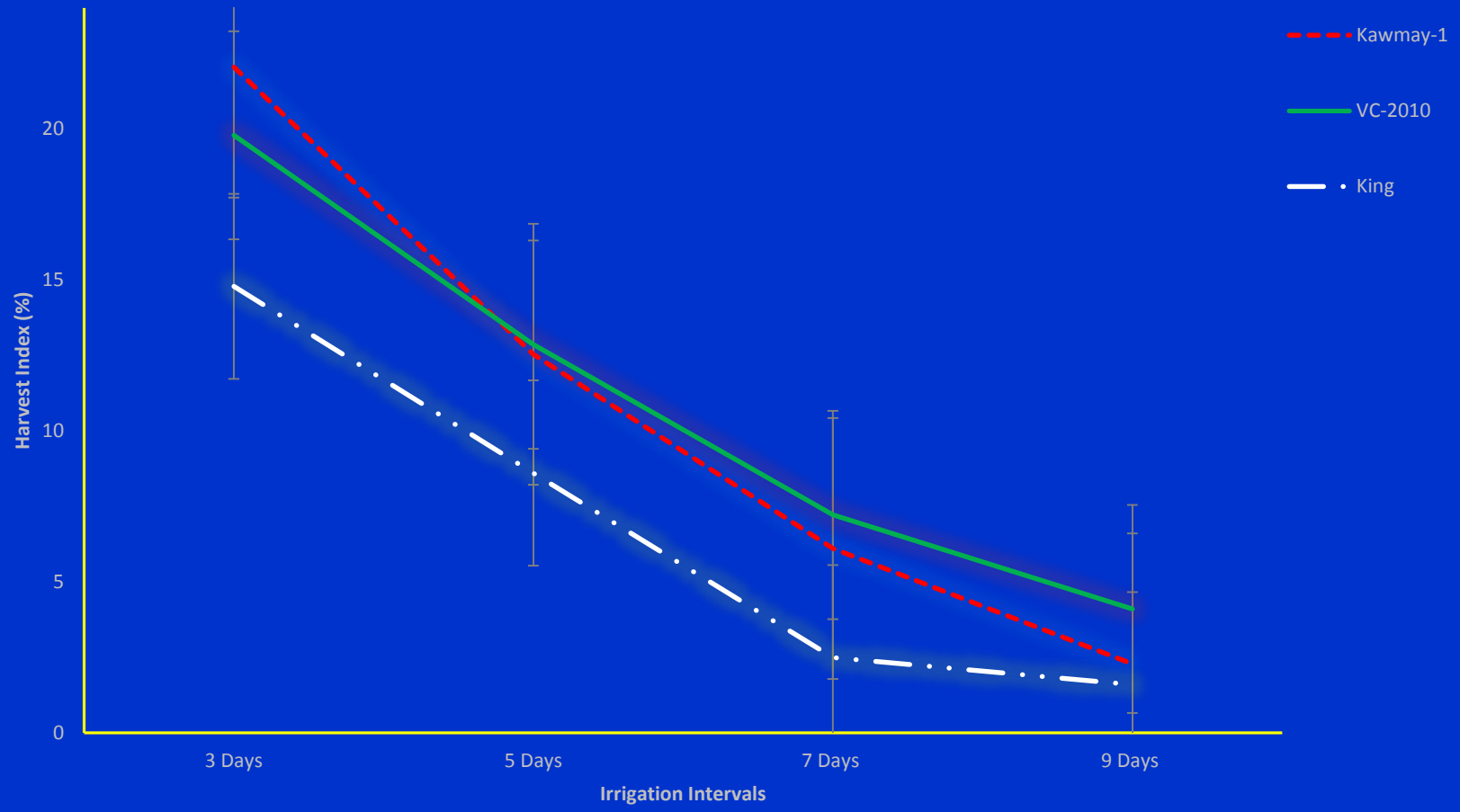
BIOLOGICAL INDICES

- Shoot Weight
- Plant Height
- Biological Yield
- Seed Yield
- Harvest Index
- Water Use Efficiency

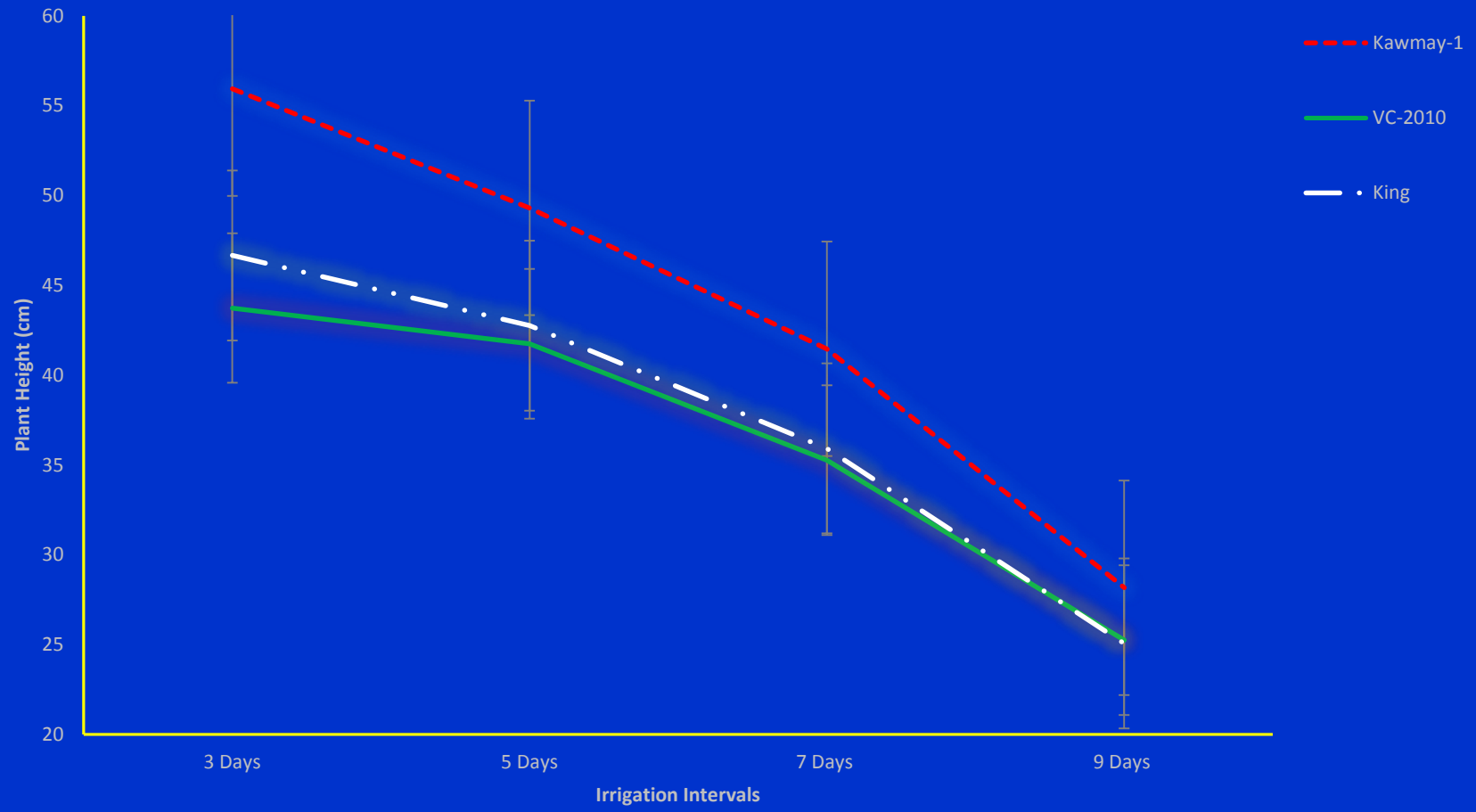
Shoot Weight (Ton/ha) of Mungbean Genotypes under Water Deficit Stress



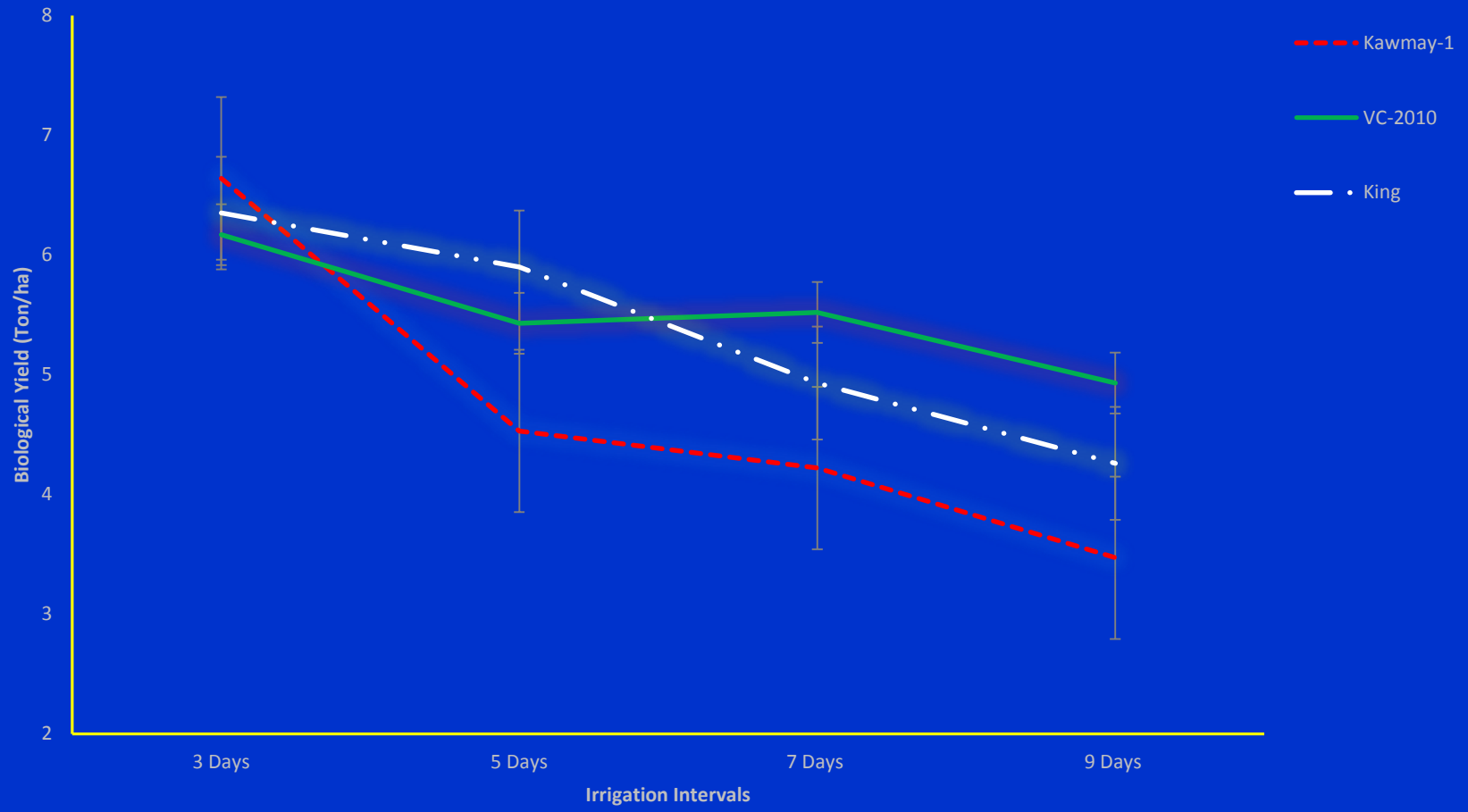
Harvest Index (%) of Mungbean Genotypes under Water Deficit Stress



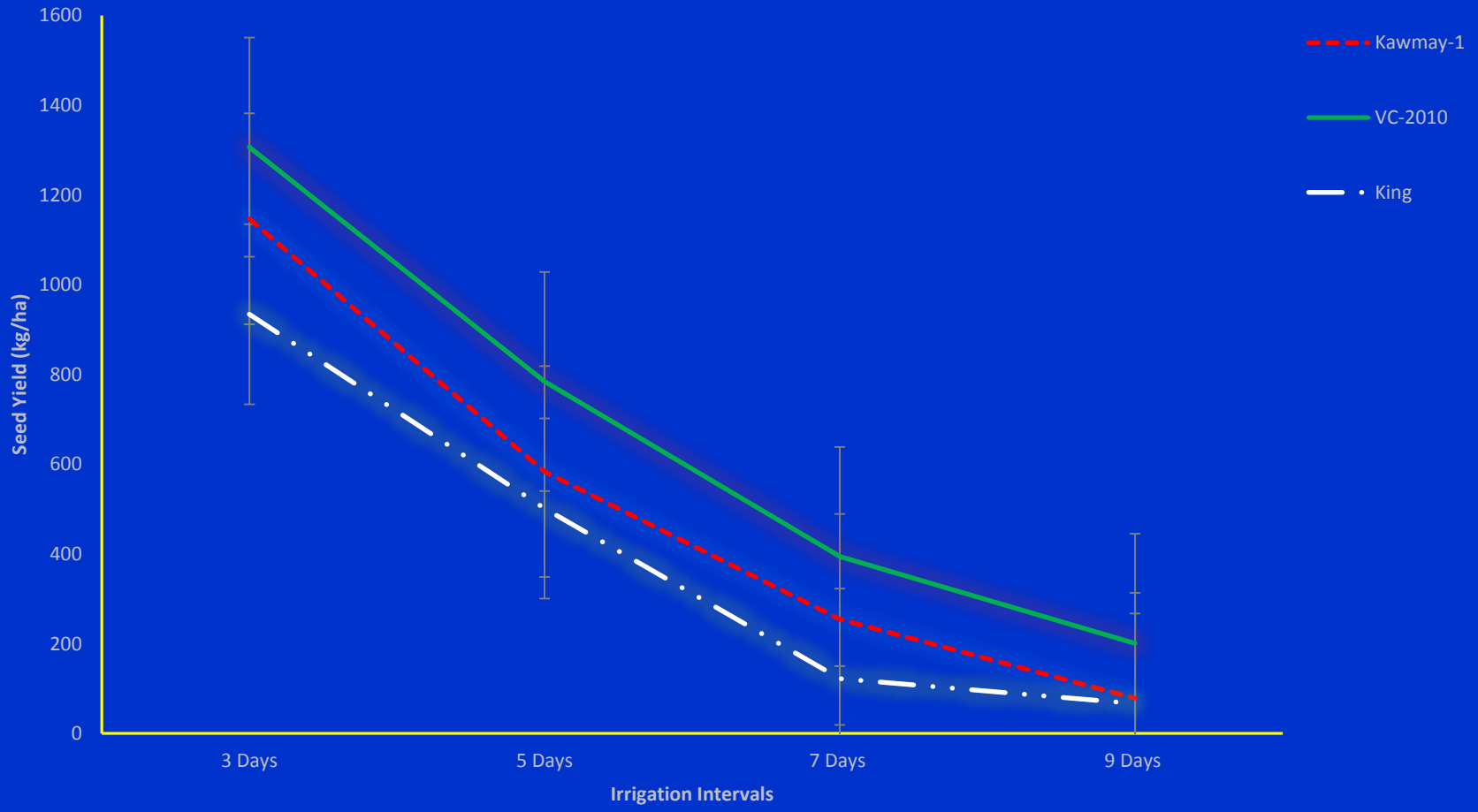
Plant Height (cm) of Mungbean Genotypes under Water Deficit Stress



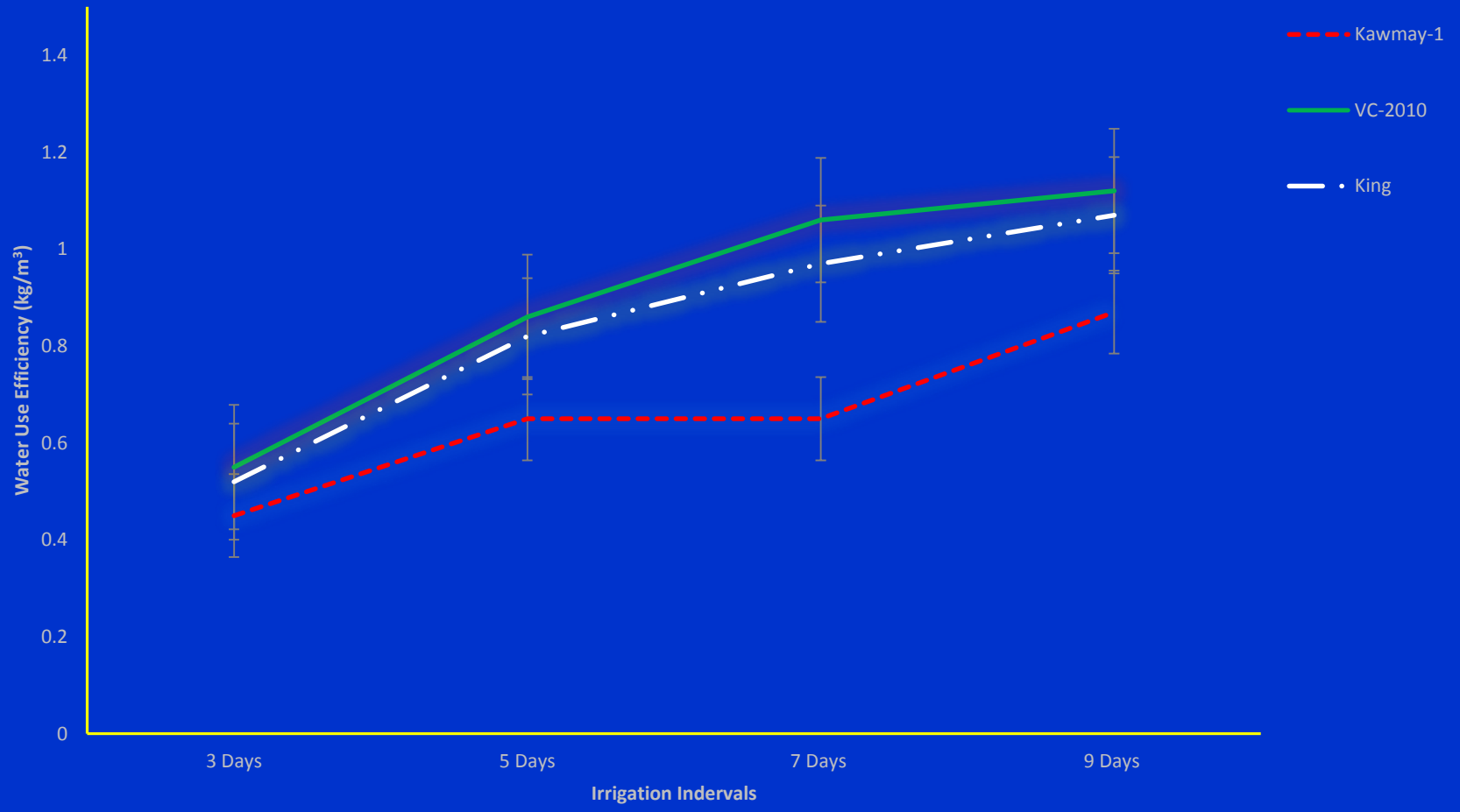
Biological Yield (Ton/ha) of Mungbean Genotypes under Water Deficit Stress



Seed Yield (kg/ha) of Mungbean Genotypes under Water Deficit Stress



Water Use Efficiency (kg/m³) of Mungbean Genotypes under Water Deficit Stress



AFTERMATH

- Water deficit stress have significantly hampered the yield and yield component characters of mungbean.
- Although low but a frequent irrigation should be applied in summer mungbean crop under arid conditions or Saudi Arabia.
- Remarkable genotypic differences have been recorded among mungbean genotypes for drought stress tolerance.
- VC-2010 Genotype has produced significant differences under high stress levels.

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