OPTIMIZING POTATO GROWTH THROUGH DIFFERENT CALCIUM APPLICATION METHODS: A MORPHO-PHYSIOLOGICAL STUDY

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ABSTRACT

The effects of different Calcium application techniqueson field grown Solanum tuber osumplants, werestudiedonyieldandyieldcontributingcharacteristics . Ten different treatments were applied and data wasrecordedonvariousmorphologicalparameterswhichweresignificantlyinfluenced. The results reflected that with the placement method ofapplication, there is quick availability of calcium to the tubers and all the parametersweresignificantlyimproved.

Key-Words: Solanum tuberosum, Calcium, Placement Method, Yield.

INTRODUCTION

Potato(SolanumtuberosumL.1956)isaworldwidecultivatedtuber-bearingplantwhich is thefourthmainfoodcrop in the world after rice (Oryzasativa), maize (Zea mays) and wheat (Triticum aestivum), in terms of both area cultivated and totalproduction.[2] Potatoes are grown as a major crop in countries with very large populations, under different climatologicalzonesfromtemperatetosub-tropicalandtropicalunderdifferentagro-ecological conditions, fromlowlandstohighlands,andinvariedsocio-economic condition.[6]Itisanimportantcommercialcashcropoftheworld.Adequatecalciumisacrucialnutrientofpotatoes.Itisinvolvedinbothcellwallandmembranes.Inadequatesuppliesofcalciumcausegrowth abnormalities like internal brown spot and hollow heart. Adequate calcium nutrition canal so improve skin colour in red and other varieties of potatoes. Abundant calcium also increases the tubers 'tissue resistance to soft rot diseases during the storage and also improve theperformance of seed potatoes .[7] Calcium has a role in cell signalling by acting as secondarymessenger and maintains the integrity of plasma membrane. It plays a regulatory role in the balance of cationanion.Calciumisneededforcellwallstrengtheningandprovidesprotectionagainst biotic anda biotic stresses .[4] Soluble Calcium can improve crop production. Calcium affects the opening of K+ channels in leaves, especially guard cells by working as secondary messenger. Calcium increases ammonium, potassium and some other monovalent absorption through 'Viets Effect.' The present paper determines the impact of different application techniques of Calcium onmorpho-physiological parameters of Potato.

MATERIALS AND METHODS

Experiment was laid out in Randomized Block Design (RBD) with three replications. The seed tuber bed (the experimental Block) was thoroughly prepared by three-time cultivations, followed with the same number of planking's.Plant Seeds were sown. Potato seed were treated with 500 ml of concern for seed borne diseases. Each plot was separated by blank ridges to avoid mixing of the inputs. All other cultural practices performed for the treatments were uniform. Finally, the crop was harvested on 5th Feb 2022 to collect the data for various qualitative and quantitative parameters. During the second year, the experiments were repeated and the data was represented as pooled mean of the two years.

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The experiment was conducted to determine the effects of different Calcium fertilizer through application techniques. Cal plus and calcium nitrate was applied by the following techniques:-

1. Broadcast method i.e. broadcast at the surface.
2. Placement methods i.e. placed near the tubers. (Earthingup)

Treatments Following ten treatmentswere includedin thisexperiment (DAP=Days afterplanting)

T0	Control(withoutCalcium)
T1	Fulldoseatplantingthroughbroadcastmethod
T2	Fulldoseatplantingthroughplacementmethod
T3	Fulldose30DAP throughbroadcastmethod
T4	Fulldose30DAPthroughplacementmethod
T5	½doseatplanting&½30DAPthroughbroadcastmethod
T6	½doseatplanting& ½30DAPthroughplacementmethod
T7	½dose30DAP&½60DAPthroughbroadcastmethod
T8	½dose30DAP&½60DAPthroughplacementmethod

RESULTS AND DISCUSSION

Emergencepercentage:

The mean values for treatments and years as per Table (1) andfigure (1). The data pertaining to emergence percentage of the potato tuber observed after 15 days of planting was recorded.TreatmentT2occupiedthefirstposition,followedbyT 4whereas,T0(control)occupiedthe bottom position. The variable means indicated that the recommended dose of calciumapplied at the time of planting through placement methods performed better as compared tothe broadcast method. The placement method of application, quick availability of calcium tothe tubers might have been effective than broadcast method for the emergence of tubers. However,itisfactthattheemergenceoftubersentirelydependsuponinternalgeneticmakeupandfoodstoredinthetubersaswellasmicroclimaticconditions.[1]

Table 1:-Impactof differentmethodsof Calciumfertilizers applicationontotalemergencepercentage

Treatments	Time, doseand method of calcium application.	Total emergence % age				Mean pooled data
		2020-21	Std. Error	2021-22	Std. Error	
T0	Control(withoutCalcium)	91	±1.47	89.5	±3.30	90.25
T1	Full doseatplantingthrough broadcast method	93.5	±.64	92.57	±2.05	93.03
T2	Fulldoseatplantingthrough placementmethod	97.5a	±1.10	92.75	±2.13	95.12
T3	Full dose30DAP through broadcast method	95.75	±.85	92.7	±.64	94.22
T4	Full dose 30DAP through placement method	96.25b	±.85	96.25a	±.64	96.25
T5	½dose at planting& ½30 DAP through broadcast method	91	±1.08	92	±.83	91.5
T6	½ dose at planting & ½30 DAP through placement method	94.5	±2.09	94	±.40	94.25
T7	½dose 30DAP&½60DAP throughbroadcastmethod	91.5	±.95	91	±1.08	91.25
T8	½ dose 30DAP&½60 DAP through placement method	93.7	±.50	94.7b	±1.08	94.2

Figure-F.1 Impact of different methods of calcium fertilizers application on total emergence percent age of potatotuber.

Number of tubers per plant:

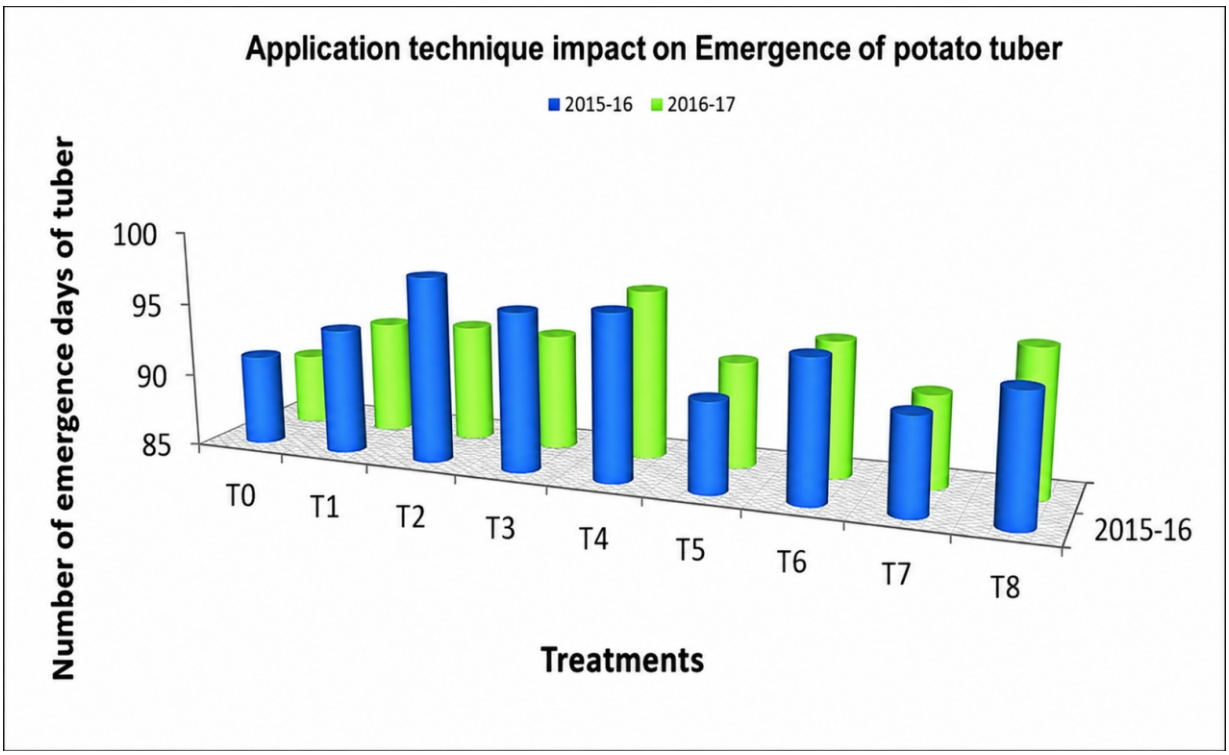

Table2.: Impact of different methods of Calcium fertilizers application on tubers weight perplant

Treatments	Time, doseand method of calcium application.	Total emergence % age				Mean pooled data
		2020-21	Std. Error	2021-22	Std. Error	
T0	Control(withoutCalcium)	207.7	±3.22	202.5	±2.89	205.1
T1	Full dos eat planting through broadcast method	211.25	±1.87	208.7	±3.76	209.97
T2	Full dos eat planting through placement method	287.5	±2.78	265.9	±5.8	276.7
T3	Full dose30DAP through broadcast method	274.9	±4.26	287.9	±.2.6	281.4
T4	Full dose30DAP through broadcast method	325.2 b	±0.50	332.7c	±.23	328.95
T5	½dose at planting& ½30 DAP through broadcast method	292.6	±3.24	299.5	±.60	296.05
T6	½ dose at planting & ½30 DAP through placement method	340c	±5.47	326.5 b	±.25	333.25
T7	½dose 30DAP&½60DAP throughbroadcastmethod	273.5	±1.78	265.5	±6.67	269.5
T8	½ dose 30DAP&½60 DAP through placement	390.5a	±3.22	370.6a	±2.42	380.55

Thevariousmorphologicalandphysiologicalparametersshowe dsignificantimprovementbyplacementmethod. The findings in conformity with the findings of Singh and Sidhu(2018)

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