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Stress Degree Days (SDD) in Relation to Yield of Potato (CV. Kufri Badshah JF – 4870)*

Abker Nooruddin and A. N. Mehta**

Department of Agricultural Meteorology, B. A. College of Agriculture, Gujarat Agricultural University, Anand Campus, Anand-388 110

Field experiments were conducted during two consecutive Rabi seasons of 1991-92 and 1992-93 at College Agronomy Farm, Gujarat Agricultural University, Anand in a split plot design. Main plots consists three dates of planting (3rd November — D_1, 16th November — D_2 and 30th November — D_3) with sub-plots having four irrigation levels (irrigation when available soil moisture-ASM reached a value of 75% of the total ASM-I_1, irrigation when the ASM reached a value of 50% of the total ASM-I, irrigation at 10 to 12 days interval-I_3 and irrigation when canopy-air temperature differential (Tc–Ta) ranged between ± 1°C-I4). Other package of practises were followed as per the recommendation. Infra-red thermometer (AG-42) was used to measure the daily canopy temperature and canopy-air temperature differential at 1400 hours for determining stress degree days (SDD) for different phenophases of the crop.

Salient features of the results of SDD are presented in Table-1 and indicate that period from early vegetative phase and tuber initiation to end of vegetative phase and tuber development (R_2–R_1) exibited significant negative correlation with SDD for both, tuber as well as total biomass. This clearly indicated that the yield of potato is more sensitive to water stress during the period of 20 days after early vegetative phase and tuber initiation i.e., the period conciding with late vegetative phase and tuber development. This conclusion is in agreement with that arrived at by Moorby and Milthorpe (1975), Walfe *et al.*, (1963) and Doorenbos and Kassam (1979).

The appereance of positive correlation between SDD at stage R_1 in 1991-92 could, however, be attributed to the exposure of the instrument to the soil rather than leaves due to poor plant population.

For the purpose of predicting crop yields regression equation was worked out (pooled for 2 years) of cumulative SDD from

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**Present address : P. O. Box 15001, SANA'A, Republic of Yeman.

stage R_1 to stage R_2 i.e., ($SDDR_2 - SDDR_1$) versus the values of tuber production at physiological maturity is as shown below :

$$Y = 3.301 - 0.028 \Sigma (SDDR_2 - SDDR_1)$$

$$(R_2 = 0.72)$$

where Y = predicted tuber yield (Kg M^{-2})

This shows that SDD from the stage R_1 to stage R_2 was found to be significantly correlated with tuber yield. It is also, a convenient method to identify the critical stage with respect to need for water and to estimate the magnitude of yield reduction due to stress at a particular stage. This suggests that there should be no water stress during the period of 20 days after early vegetative phase and tuber initiation for better yields of potato.

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TABLE 1

Correlation coefficients between stress degree days (SDD) at some important crop growth stages and tuber/total biomass at physiological maturity for 1991-92, 1992-93 and pooled.

Cumulative SDD	*1991-92*		*1992-93*		*Pooled*	
	Tuber yield	*Total biomass*	*Tuber yield*	*Total biomass*	*Tuber yield*	*Total biomass*
$SDDR_1$	0.25	0.38	–0.46	–0.32	–0.14	0.30
$SDDR_2$—$SDDR_1$	–0.98*	–0.95**	–0.81**	–0.58*	–0.85**	–0.85**
$SDDR_3$—$SDDR_2$	–0.15	–0.18	–0.31	–0.48	–0.08	–0.15
$SDDR_4$ — $SDDR_3$	–0.21	–0.11	–0.41	–0.48	–0.15	–0.07

*Significant at 5% level ** Significant at 1% level

$SDDR_1$: Cumulative SDD from emergence stage (VE) to tuber initiation stage (R_1)

$SDDR_2 - SDDR_1$: Cumulative SDD from stage R_1 to canopy closure stage (R_2)

$SDDR_3 - SDDR_2$: Cumulative SDD from stage R_2 to tuber bulking stage (R_3)

$SDDR_4 - SDDR_3$: Cumulative SDD from stage R_3 to physiological maturity stage (R_4)

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