Journal of Agrometeorology 14 (1) : 82-84 (June 2012)

Short communication

Quantification of heat units for chickpea under coastal environment of Andhra Pradesh

G. MRUDULA, Y.ASHOKA RANI and S.B.S.N.RAO

Agricultural College, ANGRALI, Bapatla

Chickpea (*Cicerarietinum*) commonly known as gram and Bengal gram is grown in India as winter season (*rabi*) crop and it requires cool and dry weather for optimum growth. Chickpea being a crop of low input requirement replaced the rice cultivation in some coastal tracts of Andhra Pradesh. The concept of thermal use efficiency has been used by several workers to compare the performance of different varieties or of several dates done elsewhere (Rajput *et al*., 1987; Rao *et al*., 1999; Aggarwal *et al*., 1999) but, it has not hitherto been reported from Andhra Pradesh.

A field experiment was conducted at Agricultural College Farm, Bapatla (A.P) during *rabi* season of 2007-08. The soil (0-30 cm) of the experimental site is black clay loam in texture with pH of 7.4. The weather parameters were recorded at the meteorological unit. The experiment was laid out in split plot design with 12 treatment combinations comprising of four sowing dates (November 8th, November 18th, November 28th and December 8th) and three cultivars (KAK-2, JG-11 andAnnegiri) with three replications. A uniform dose of 20 kg N + 50 kg P_2O_5 was suppliedas basal through urea and single super phosphate.

The growing degree days (GDD), was calculated using base temperature of 5^{0}C (Nuttonson, 1955), Heat use efficiency (HUE), which is a measure of amount of dry matter or grain yield produced per unit of GDD, was worked out as per procedures reported by Sahu *et al*. (2007).

The results revealed that the crop sown on 18th November took 118 days for KAK-2, 111 days for JG-11 and 112 days for Annegiri from sowing to maturity, and it reduced under both early and delayed sowings. The accumulated growing degree days from sowing to maturity varied from 1979 to 2247 ^{0}C d (Table 1) with different dates of sowing, maximum under second date of sowing and minimum under fourth date of sowing. GDD requirement was high for KAK-2 followed by Annegiri and low for JG-11.

The amount of total drymatter produced by the crop was maximum under 18th November sowing (3019 kg ha^{-1}) followed by 8th November and minimum under 8th December sowing (1828 kg ha^{-1}). In both the earlier and later sown crops, the amount of total drymatter produced by the crop decline to an extent of 10.4 percent (8th November) to 39.4 percent (8th December). The amount of total drymatter produced by three varieties were in the order of JG-11 > KAK-2 >Annegiri.

The heat use efficiency was high for second sowing. It was low for November 28th crop upto 45 days after emergence and later 8thDecember sown crop recorded the lowest value. The heat use efficiency was maximum for 18th November sown crop (1.567), followed by 8th November (1.307) and minimum was with December 8th (0.851). The increase in heat use efficiency was maximum at 45 to 60 days after emergence for November 8th sown crop, 30 to 45 days after emergence for 18th November sown crop, 15 to 30 days after emergence for November 28th and December 8th sown crop. A varietal difference was significant at all stages of crop growth. It was higher in KAK-2 upto 45days after emergence, JG-11 showed the highest. It was lower in Annegiri at all stages of crop growth (Table -2).

The correlation analysis between yield and phenophase wise heat units revealed that yield of KAK–2 was positively and significantly correlated (r=0.97*) with GDD during podding stage. In JG – 11, yield was negatively significantly correlated (r=-0.99*) with GDD during vegetative stage was observed.

Table 1: Accumulated growing degree days (GDD) duringdifferent phenophases seed yield and total dry matter of chickpea under different environments

Treatments	Emergence	Vegetative	Flowering	Podding	Maturity	Seed yield (kg ha^{-1})	Total drymatter (kg ha^{-1})
Sowing dates							
November 8th	95	334	575	522	615	674	2459
November 18th	97	310	564	583	693	846	3178
November 28th	130	311	512	546	676	617	1747
December 8th	147	287	521	503	521	39.22	12.24
Mean	117.25	310.5	543	538.5	626.25	117.57	36.71
SD±	25.51	19.19	31.14	34.49	77.74	674	2459
Cultivars							
KAK-2	134	326	528	593	612	663	2703
JG-11	109	300	543	494	632	1194	3019
Annegiri	109	305	558	528	636	534	2295
Mean	117.33	310.33	543	538.33	626.66	459	1828
SD±	14.43	13.79	15.0	50.30	12.85	32.70	11.00

Table 2: Heat use efficiency (kg ha^{-1} ^{0}C day^{-1}) of chickpea interms of biological yield as influenced by dates of sowing and varieties

Treatments	Days after emergence (DAE)						
	15	30	45	60	75	90	At maturity
Sowing dates							
November 8th	0.352	0.684	0.781	1.202	1.267	1.307	1.248
November 18th	0.449	0.700	1.117	1.452	1.412	1.567	1.356
November 28th	0.297	0.648	0.774	0.902	0.914	0.898	1.043
December 8th	0.348	0.686	0.792	0.849	0.851	0.830	0.916
SEm±	0.004	0.005	0.011	0.046	0.004	0.029	0.006
CD	0.015	0.017	0.039	0.160	0.013	0.101	0.019
CV(%)	2.51	1.52	2.74	8.93	0.70	5.38	1.04
Cultivars							
KAK-2	0.488	0.823	1.114	1.173	1.165	1.200	1.117
JG-11	0.353	0.664	0.798	1.328	1.370	1.395	1.503
Annegiri	0.244	0.552	0.686	0.804	0.798	0.856	0.803
SEm±	0.011	0.008	0.016	0.036	0.004	0.027	0.006
CD	0.034	0.023	0.048	0.109	0.012	0.081	0.019
CV(%)	7.704	2.77	4.50	8.07	0.87	5.74	1.32

REFERENCES

Aggarwal, K.K., Shaker, U., Upadhyay, A.P., Gupta, V.K. and Shanker, U. (1999).Accumulated heat unit requirements for different phenophases of wheat (*Triticumaestivum*) cultivars as influenced by sowing dates at Jabalpur. *J. Agromet*., 1: 173-76.

Nuttonson, M.Y (1955). Wheat climatic relationship and use of phenology in ascertaining the thermal and photothermal requirements of wheat.*Am. Inst. crop Ecol. Washington D.C.*

Rajput, R P., Deshmuk, M.R. and Paradkar, V.K. (1987).Accumulated heat units and phenology relationship in wheat as influenced by planting dates under late sown condition.*J. Agron.Crop Sci.,* 159: 234-48.

Rao, V.U.M., Singh, D. and Singh, R. (1999). Heat use efficiency of winter crops in Haryana. *J. Agromet.,* 1: 143-48.

Sahu, D.D., Chopada, M.C and Patoliya, B.M. (2007).Determination of sowing time for chickpea varieties in south Saurashtra, India.*J.Agromet.,* 9 : 68-73.

Received : September 2011 ; Accepted : May 2012