ISSN NO. 2320-5407

Journal homepage: http://www.journalijar.com
Journal DOI: 10.21474/IJAR01

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH

RESEARCH ARTICLE

RESPONSE OF PIGEONPEA GENOTYPES OF DIFFERENT MATURITY DURATION TO RADIATION USE EFFICIENCY UNDER RAINFED CONDITIONS OF ANDHRA PRADESH.

M. RATNAM, S. RAJAMANI AND E. NARAYANA.
Regional Agricultural Research Station, Lam, Guntur-34.

Manuscript Info

Manuscript History:

Received: 17 February 2016
Final Accepted: 23 March 2016
Published Online: April 2016

Key words:

Corresponding Author
M. RATNAM.

Abstract

A field experiment was carried out during *kharif* 2014-15 with 22 medium and 21 mid early duration pigeonpea genotypes on clay soil under rainfed conditions at Regional Agriculture Station, Lam, Guntur. The experiment was laid out in randomized block design replicated thrice to know the response of different duration pigeonpea genotypes to radiation use efficiency (RUE). The results indicated that among medium duration seven genotypes viz., Co6, NTL740, PDKV1942, RVKT 297, AKTM 10-12, LRG151 and GJP1304, among the mid early group six genotypes viz., PRG 200, CRG 140, PT 417-8-2-1-2, PT0012, AKT 12-01 and PRG 305 utilised maximum radiation use efficiency and attained higher yield per ha.

Introduction:-

Pigeonpea [*Cajanus cajan* (L.) Millsp.] a major pulse crop, is grown usually under rainfed environments across Semi-arid tracts of India. It is grown under rainfed in prone drought areas where day length varies from 11 to 14 h and large differences in temperature are experienced, largely due to variations in altitude and latitude. Variability in weather causes substantial fluctuations in pigeonpea production and productivity. To overcome the productivity fluctuations, breeder creates new genotypes within their genetic limits but yield is determined by the environment. Exploiting the potentiality of any genotype, climatic plays a vital role. Climatic factors viz., temperature, rainfall and light are most important for optimum growth and development there by exploits the yield potentiality of a particular genotype. Among these, temperature plays a key role in almost all biological processes of genotype right from sowing to harvest therefore, any possible understanding of climate-yield relationship between the genotypes may help to determine the best genotype to maximize yield potentiality under rainfed environment. Thus, rate of development of pigeon pea genotypes from planting to maturity is a function of radiation use efficiency which is the derived factor of temperature, GDD, HTU and solar radiation. So a field experiment was conducted to understand the effect of radiation use efficiency and yield response of different maturation genotypes of pigeon pea under rainfed environment.

Material and methods:-

The field study was conducted at Regional Agricultural Research Station, Lam, Guntur-34 (Latitude: $16^{0}18^{1}$, Longitude: $80^{0}29^{1}$Altitude: 33 m.a.m.s.l '). The climate is subtropical with mean annual rainfall of 950 mm. The soil of the experiment field was clay loam in texture, neutral to slightly alkaline in reaction (pH 7.8 to 8.2), medium in organic carbon content (0.51%), low in available N (220 $kgha^{-1}$), high in available P (58.7 $kgha^{-1}$) and available K (1099 $kgha^{-1}$). The experiment was conducted during *kharif* 2014-15 under rainfed environment of Krishna zone. Data on maximum and minimum temperatures, sunshine hours and rainfall were recorded from Agrometeorological field unit (AMFU) in the premises. Daily readings averaged over standard weeks in to month during crop growing period are plotted in table 1. One seed was dibbled at an inter and intra row spacing of 180 and 20 cm, respectively to achieve density of 27,777 plants ha^{-1}. Two different matured groups i.e medium duration viz., Co6, NTL740, PDKV1942, RVKT 297, AKTM 10-12, LRG151, GJP1304,SKPN 10-34, WRP 1, TDRG 107, KDPV 1935, WRG

223, LRG 133, Mahajbeej105, GJP 1310, CRG 2010-11, BDN 2010-1, LCP 8863, TRG 78, BRG 14-1, TDRG 179, GRG 160 and medium early duration viz Co6, NTL740, PDKV1942, RVKT 297, AKTM 10-12, LRG151, GJP1304, SKPN 10-34, WRP 1, TDRG 107, KDPV 1935, WRG 223, LRG 133, Mahajbeej105, GJP 1310, LCP 8863, TRG 78, TDRG 179, GRG 160 pigeon pea genotypes were sown on 27-07-2014 and replicated thrice in R B D design. A common cultivation practices were followed for all genotypes as per the recommended package of practices for the agro-climatic zone. The cumulative degree days (GDD), Helio Thermal unit (HTU) solar radiation and radiation use efficiency were calculated by using the following equations (Girijesh *et al*, 2011)

$$GDD=\sum\left(\frac{Tmax+Tmin}{2}-T_{base}\right)$$

HTU= GDD * SSH (bright)

Solar radiation= SSH *3.66 (mjm^{-2})

Radiation use efficiency= yield ÷ Solar radiation (mjm^{-2})

Base temperature for the pigeonpea was taken as 10 ^{0}C (Patel N.R. and Mehta A.N. 2001) and solar radiation was calculated by using the standard units and conversions i.e., one bright sunshine hour is equal to 3.66 mjm^{-2} of solar radiation (www.http://pv.asu.edu).

Results and discussions:-

Agroclimatic environment prevailed during crop growth period have been shown in table 1 & 1a. Agro climatic environment prevailed during crop growth period were total rainfall of 536.6 mm in 35 rainy days received as against the normal on 619.2 mm in 38 rainy days with per cent deviation of minus 30 and that indicates the normal status of rainfall prevailed during entire crop growth period. An average mean maximum and minimum temperature received the pigeon pea genotypes are 32.1^{0}C and 18.9^{0}C as against the normal of 31.6^{0}C and 21.0 ^{0}C (Table 1.).

Table 1. Agro climatic environment during crop growth period

MONTH	T max (^{O}c)		T min (^{O}c)		Total rain-fall mm		Rainy Days	
	Normal	Actual	Normal	Actual	Normal	Actual	Normal	Actual
AUG	33.3	34.2	24.5	19.7	187.7	130.0	11	18
SEP	33.1	32.7	24.4	18.7	168.9	228.4	8	9
OCT	32	31.8	22.9	17.0	167.7	133.0	7	5
NOV	31	30.6	20.5	21.5	50.9	45.2	3	3
DEC	30	29.8	17.4	18.4	13.6	0	7	0
JAN	30.7	29.9	17.3	17.6	17.6	0	1	0
FEB	34.5	32.1	20.0	19.5	12.8	0	1	0
Total					**619.2**	**536.6**	**38**	**35**
Mean	**32.1**	**31.6**	**21.0**	**18.9**				

Table 1a. Agro climatic environment during crop growth period

MONTH	Sunshine hours			GDD	HTU	Solar Radiation mjm^{-2}
	Normal	Actual	Cumulative			
AUG	4.0	4.8	150.20	24.35	3657.37	17.568
SEP	4.7	4.0	120.70	23.75	2866.63	14.64
OCT	5.5	5.6	175.10	21.40	3747.14	20.496
NOV	3.5	5.8	102.70	21.25	2182.38	21.228
DEC	6.7	4.3	134.20	16.60	2227.72	15.738
JAN	7.5	6.4	198.00	16.10	3187.80	23.424
FEB	8.0	8.8	224.70	19.75	4437.83	32.208
Total	**39.9**	**39.7**	**1105.6**	**143.2**	**22306.9**	**145.3**

Right from sowing to physiological maturity, sun shine hours (1105.6), growing degree day (143.2), HTU (22306.9) and solar radiation (145.3 mjm^{-2}) were commonly received by all the genotypes of pigeonpea during entire growth

(Table 1a). Temperature derivatives, growing degree day (GDD), Helio Thermal unit (HTU) solar radiation and radiation use efficiency differed greatly among different groups of pigeon pea genotypes studied.

Among pigeonpea genotypes studied, seven medium duration genotypes viz., Co6, NTL740, PDKV1942, RVKT 297, AKTM 10-12, LRG151 and GJP1304 and six mid early genotypes viz., PRG 200, CRG 140, PT 417-8-2-1-2, PT0012, AKT 12-01 and PRG 305 utilised maximum radiation use efficiency and attained higher grain yield per ha (Table 2.), this may be attributed due to that the phenology of the pigeonpea crop matches the resources of the production environment and genetic variability existing among pigeon pea genotypes. These results were inconformation with Richards, 1989 and Patel *et al*, 2000.

Table 2. Response of medium and mid early duration pigeonpea genotypes to radiation use efficiency.

Genotypes					
Medium duration (180 days and above)	**yield kg ha^{-1}**	**RUE mjm^{-2}**	**Mid early duration (130-180 days)**	**yield kgha^{-1}**	**RUE mjm^{-2}**
Co6	2634	18.13	PRG 200	2630	18.10
NTL740	2450	16.86	CRG 140	2593	17.85
PDKV1942	2383	16.40	PT 417-8-2-1-2	2415	16.62
RVKT 297	2367	16.29	PT0012	2317	15.95
AKTM 10-12	2345	16.14	AKT 12-01	2212	15.22
LRG151	2251	15.49	PRG 305	2210	15.21
GJP1304	2217	15.26	BDN 2004-1	2170	14.93
SKPN 10-34	1965	13.52	BRG 14-2	2166	14.91
WRP 1	1919	13.21	PT 417-8-2-2	2142	14.74
TDRG 107	1892	13.02	TDRG 79	2131	14.67
KDPV 1935	1857	12.78	WRGE 96	2019	13.90
WRG 223	1793	12.34	SKNP 1004	1988	13.68
LRG 133	1774	12.21	TDRG 67	1933	13.30
Mahajbeej105	1576	10.85	UPAS 120	1722	11.85
GJP 1310	1550	10.67	PA 426	1692	11.64
CRG 2010-11	1474	10.14	PA 419	1550	10.67
BDN 2010-1	1430	9.84	PRG 300	1512	10.41
LCP 8863	1419	9.77	SKPN 1021	1440	9.91
TRG 78	1381	9.50	PUSA 2014-2	976	6.72
BRG 14-1	1200	8.26	NTL 669	934	6.43
TDRG 179	1177	8.10	LRG 152	800	5.51
GRG 160	830	5.71			
CD (p = 0.05)	**476**	**4.15**		**479**	**3.62**
CV (%)	**16.4**	**20.8**		**15.9**	**17.4**

References:-

1. Girijesh,G.K., Kumara Swamy, A.S., Sridhara ,S.Dinesh Kumar, M.,Vageesh, T.S and Nataraju,S.P.2011. Heat use efficiency and hello-thermal units for maize genotypes as influenced by dates of sowing under southern transitional zone of Karnataka state. International journal of sciences and nature, 2(3): 529- 533
2. Patel, N.R.,. Mehta A.N and Shekh, A.M. 2000. Radiation absorption, growth and yield of pigeonpea cultivars as influenced by sowing dates. Exp. Agric., 36: 291-301
3. Patel N.R. and Mehta A.N. 2001. Phonological development and yield of two diverse Pigeonpea *[Cajanus caj an* (L.) MiUsp.] Genotypes in relation to weather. *Journal. Agric. Physics,* 1(*1):* 52-57
4. Richards, R.A. 1989. Breeding for drought resistance-physiological approaches. In*:Drought Resistance in Cereals*. Baker, F.W.G. (Ed.), pp. 65-79. CAB International, Wallingord.
5. www.http://pv.asu.edu.