



SCREENING FOR DROUGHT AND HELICOVERPA ARMIGERA TOLERANCE IN SELECTED CHICKPEA (*Cicer arietinum* L.) GERMPLASM IN SEMI-ARID AREAS OF KENYA

GCP Funded Project TL1-Improving drought tolerance in chickpeas for Africa and Asia (PI-Rajeev Varshney)
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Introduction

Since chickpea is inherently drought tolerant legume crop, its production in Semi arid regions of Eastern and Southern Africa could provide reliable alternative food security legume to reducing the adverse effects caused by drought stress and increasing facing food shortages. Chickpea is a crop that can since it is more drought tolerant and able to escape the effects of terminal stress common in ASAL of ESA.

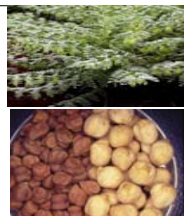


Fig 1. Chickpeas-Desi & Kabuli

Objectives

1. Evaluate 289 chickpea genotypes reference and mapping population for drought tolerance, HI and yield performance in marginal rainfall areas of Kenya
2. Screening of 30 selected chickpea genotypes for *Helicoverpa armigera* resistance in Kenya

MATERIALS AND METHODS

- The study conducted in dryland site in Kenya in 2008/2009.
- 289 lines for drought tolerance in lattice design and 30 lines for *Helicoverpa* in RCBD. Spacing 40x10cm 2m long
- Data taken HI, yield, seed mass, maturity periods. Analysis by SAS, DMRT



Fig 2. Chickpea showing variability in growth and maturity at Mogotio Kenya

RESULTS & DISCUSSION

EXPT I: Drought Tolerance Screening

Table 1. Elite lines for HI, yield and other traits

Genotype	DFP (days)	DM (days)	Yield (kg/ha)	HI	Seed mass (g)
ICC7272	62	98	2410	0.67	35.0
ICC2580	50	91	2872	0.60	24.4
ICCV95311	50	87	2211	0.60	34.6
ICCV92311	44	93	2087	0.59	35.9
ICC9895	57	91	2489	0.57	25.8
ICC4814	42	90	1977	0.56	17.3
ICCV10	52	85	2130	0.54	21.2
ICC12155	65	99	2600	0.53	26.4
IG6044	53	89	2467	0.50	23.8
ICC7255	55	89	2599	0.49	31.4
ICCV97105	56	96	1567	0.48	32.9
ICC10399	50	87	2430	0.48	31.4
IG74036	56	88	2659	0.48	24.9
CC7315	57	89	2870	0.47	29.5
IG10500	68	85	2737	0.44	32.7
SE ±	5.2	10.6	466	0.12	3.8

Table 2. Genetic variability of drought screening of 289 genotypes

Trait	DFP (days)	DM (days)	PH (cm)	BM (kg/ha)	GY (kg/ha)	HI	HSM (g)
Range	44-74	82-133	14.1-42.4	979-11184	219-4552	0.18-0.69	8.7-51.4
Mean	60.3	95.4	26.2	4457	2026	0.45	18.9
SE ±	5.2	10.6	6.7	1908	1066	0.12	3.8

EXPT II; *Helicoverpa armigera* Screening

Table 3. Elite genotypes for *Helicoverpa* tolerance

Genotype	Larvae count at podding		Pod damage score		Pod damage %		Pods / plant	Yield Kg/ha	100 seed mass (g)
	original	Transform	original	Transform	original	Transform			
EC 583311	1.66	0.39	1.33	3.56	10.64	40	2660	20.6	
ICCV X 960 183-28	1.67	0.36	1.33	6.20	11.78	46	1795	17.2	
ICCV X 960 183-69	1.58	0.40	1.33	6.53	14.24	40	1966	17.3	
ICCV X 960 186-1	1.36	0.37	1.00	6.80	15.07	40	1651	20.3	
ICC 506	2.08	0.44	1.00	7.22	15.33	41	1772	18.8	
ICCV X 960 183-72	3.04	0.59	1.00	7.25	15.10	40	2342	17.6	
ICC 4959	2.24	0.47	1.33	7.36	14.91	40	2191	19.6	
EC 583264	2.17	0.50	1.67	8.61	16.43	36	2544	27.6	
EC 583250	2.39	0.51	1.33	8.79	16.94	40	1856	17.7	
ICC 14402	3.04	0.61	1.33	9.31	17.61	37	1734	18.0	
Range	1.3-6.9	0.3-0.9	1.0-3.0	3.6-25.6	10.6-29.4	36-56	394-2660	14.7-27.6	
SE ±	1.55	0.18	0.99	8.59	7.25	3.62	569.80	4.00	

Fig 6. *Helicoverpa* pest evaluation and monitoring

CONCLUSION AND RECOMMENDATION

- Several chickpea genotypes screened for drought and *Helicoverpa* resistance indicated high degree of drought tolerance in Kenya
- In drought screening trial, genotypes ICC 2580, ICC 7272, IC CV92311, ICC3362, IC CV 95311 and 9895 had both greatest HI (0.63-0.69) and grain yields (>2ton/ha).
- Genotypes ICC 14831, EC 583311, EC 583318, ICC 506, IC CV 10, and IC CV9 960183-69, IC CV X 960 186-1 were the most tolerant with highest grain yield (1500-2600 kg ha-1)
- 3-5 Promising candidates with acceptable quality traits will be evaluated further and released as commercial chickpea varieties for growing in semi-arid lands of Kenya.

Fig 3. Genetic diversity for HI for 289 lines

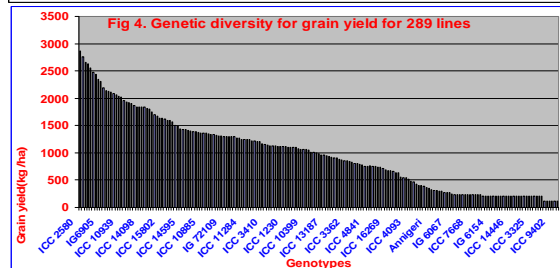
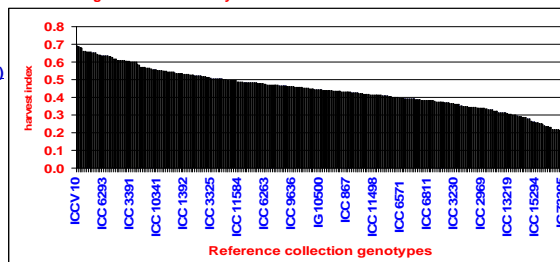
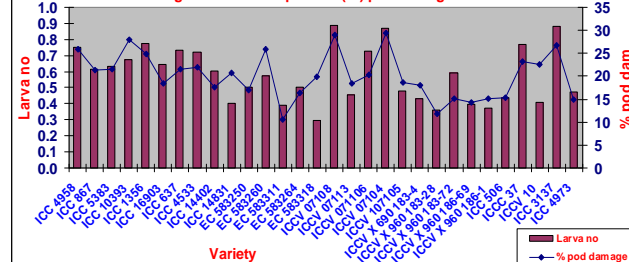


Fig 4. Genetic diversity for grain yield for 289 lines

Remarks for drought tolerance screening

- Observed significant difference ($P < 0.05$) in measured traits among 289 screened chickpea, under low rainfall <220 mm rainfall
- Days to flowering and maturity ranged between 44-74 and 82-144 days, respectively.
- Mean harvest index (HI) ranged from 0.18-0.67, with mean of 0.43.
- Genotypes ICC 2580, ICC 7272, IC CV92311, ICC3362, IC CV 95311 and 9895 had both greatest HI (0.63-0.69) and grain yields (>2.1tons ha-1).
- They also had high 100-seed weight (20-35 gm) which could have contributed to high yield.

Fig 5. Larva verse percent (%) pod damage on 30 lines



The genotypes ICC 14831, EC 583311, EC 583318, ICC 506, IC CV 10, and IC CV9 960183-69, IC CV X 960 186-1, IC CV X 960 183-28, had lower larval population, and also suffered low pod damage, of which of most of them yielded between 1500-2600 kg ha-1. Most susceptible (high damage and larval counts) where ICC 3137, IC CC 37,



Fig 7. Future of Chickpea in Kenya- a commercial enterprise



Visit to chickpea site in Kenya

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