



# International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

## Subhash Chandra

Head, Bioinformatics & Principal Statistician,  
Patencheru, India

*“...not only the study presented here but also nearly all research studies at ICRISAT use GenStat to meet their design and computing requirements.”*



The International Crops Research Institute for the Semi-Arid Tropics, or ICRISAT, is an internationally renowned, not-for-profit agricultural research organisation. As one of the fifteen Future Harvest Centres of the Consultative Group on International Agricultural Research (CGIAR), ICRISAT is well placed at the fore-front of agricultural research and development.

### The Problem

Chickpea is a very important, rain fed, cool season food legume, grown mainly by small farmers in the semi-arid tropics, West Asia and North Africa regions.

Molecular markers linked to traits of agro-economic importance, facilitate marker-aided selection of promising germplasm for rapid crop improvement.

A biometric analysis was carried out using GenStat to identify microsatellite markers, out of a total of 21, tightly linked to root traits in chickpea.

### The Solution

The study involved phenotyping data on 257 recombinant inbred lines (RILs) and genotyping data on these RILs for 21 microsatellite markers. GenStat's REML facilities were used to obtain the best linear unbiased predictors (BLUPs) of average phenotypic performance of RILs.

The Chi-square facilities were then used on the genotyping data on each marker to test for conformity to expected Mendelian segregation ratio, and on pairs of markers to statistically test the existence of linkage.



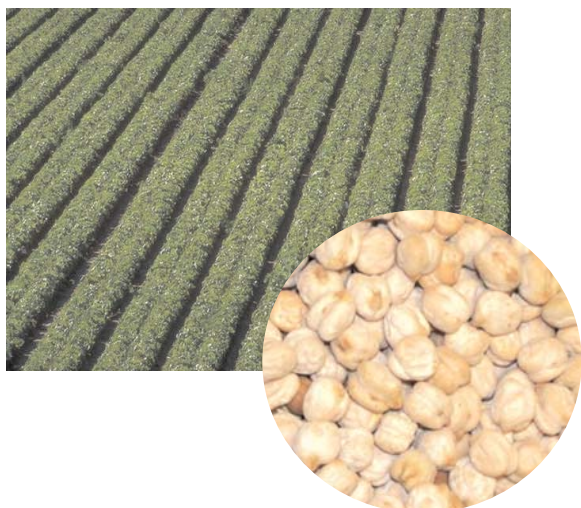
**GenStat®**

**know**

*“GenStat handled all analysis very well.”*

The Kolmogorov-Smirnoff and Mann-Whitney U tests were used to compare the phenotypic distribution of genotypic classes for each marker to see whether the marker in question was significantly linked to the traits. Multiple linear regression facilities, in combination with bootstrap and jackknife resampling procedures, were used for reliable and robust identification of the smallest possible subset of markers significantly linked to the root traits, treating a particular root trait as dependent and the markers as independent variables.

Subhash states that *“Using GenStat we could reliably identify one microsatellite marker that was consistently tightly linked to three of the four root traits. This is a very useful result to facilitate rapid crop improvement in chickpea.”*



## Company Fact File

Institution: International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

Location: ICRISAT-Patancheru (Headquarters)  
Patancheru 502324  
Andhra Pradesh  
India

Telephone: +91 40 23296161

Email: ICRISAT@CGIAR.ORG

Fax: +91 8455 282828

Research: Founded on five global research themes:

- ▷ Biotechnology
- ▷ Crop Improvement
- ▷ Agroecosystems
- ▷ Seed systems
- ▷ SAT futures

Web: <http://www.icrisat.org>

*“GenStat at ICRISAT has been the major statistical computing software of choice for design and statistical analysis since 1979. It has very effectively met our design and statistical computing requirements over these years”*

VSN International Ltd

5 The Waterhouse, Waterhouse Street, Hemel Hempstead, Herts, UK, HP1 1ES  
TEL: +44-(0)1442-450230 FAX: +44 (0)870-1215653 WEB: <http://www.vsn-intl.com>

*VSN International: The Developers of GenStat*

