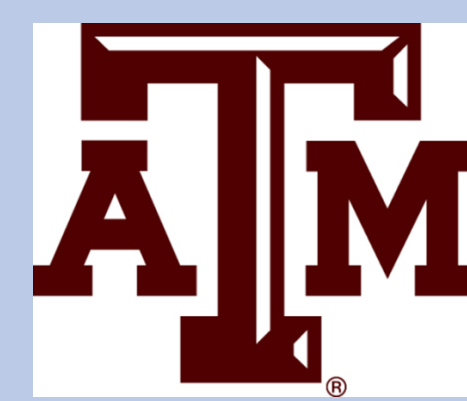


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INTRODUCTION

Cowpea [*Vigna unguiculata* (L.) Walp] is the third most important grain legume after ground nuts and dry beans. It is a nutritious crop and it is eaten as green leaves, green pulse and grain. It serves as a natural supplement to cereals and as a major source of cheap vegetable protein in South Africa. Production of cowpea in South Africa is limited by lack of improved varieties and quality seeds for planting. Therefore, new introductions of cowpea breeding lines were made and evaluated for their adaptation. These introduced cowpea breeding lines have not been screened for cowpea aphid resistance in South Africa. Cowpea aphid is known to be one of the major damaging insect pests to cowpea in South Africa (Asiwe, 2009).

Objective

Evaluate selected cowpea varieties with known drought- and low-phosphorus tolerance to identify lines which are also aphid resistant in Sub-Saharan Africa.



97 tested varieties exhibit differences in aphid resistance, and tolerance to bacterial blight. Resistant lines have potential to improve cowpea germplasm in Africa.

METHODS

- University of Limpopo Experimental Farm in Mankweng, Limpopo Province, South Africa
- Sandy, loam soil type
- Completely randomized block design
- Plot size was one row (75 cm row spacing) by 3 m in triplicate
- 2013-14**
 - 97 improved varieties
 - 'Vita 7' known aphid susceptible cultivar was used as a control
 - Varieties from International Institute of Tropical Agriculture (IITA), Nigeria, TAMU breeding lines, cultivars released in USA and South Africa
 - Basagran used for weed control
 - Three weeks prior to planting test varieties, Vita 7 was planted in areas that surrounded the experimental plots and blocks to ensure uniform infestation

Data Collection & Analyses

- Aphid infestation score on a 9-point scale (Jackai et al., 2001), where:
 - 1 = no infestation and is highest resistance
 - 9 = death of plant and most susceptible
- Plant vigor score (3 point scale), where:
 - 1 = very weak
 - 2 = medium strength
 - 3 = vigorous
- Plant biomass (g) of individual plants sampled to ground level
- Plant height (cm) at 3 weeks after infection and at maturity
- Grain yield (g) of individual plants
- Data analyzed with Statistix 9.0
- Significant means separated with Duncan's Multiple Range Test



Resistant line with vigor score of 2-3 (left)
Susceptible line with vigor score of 1 (right)

RESULTS

Fig. 1. Aphid infestation score (9-point scale; 1 = resistant; 9 = susceptible and plant death) of the 20 most resistant cowpea varieties of 97 varieties grown in South Africa in 2013-14

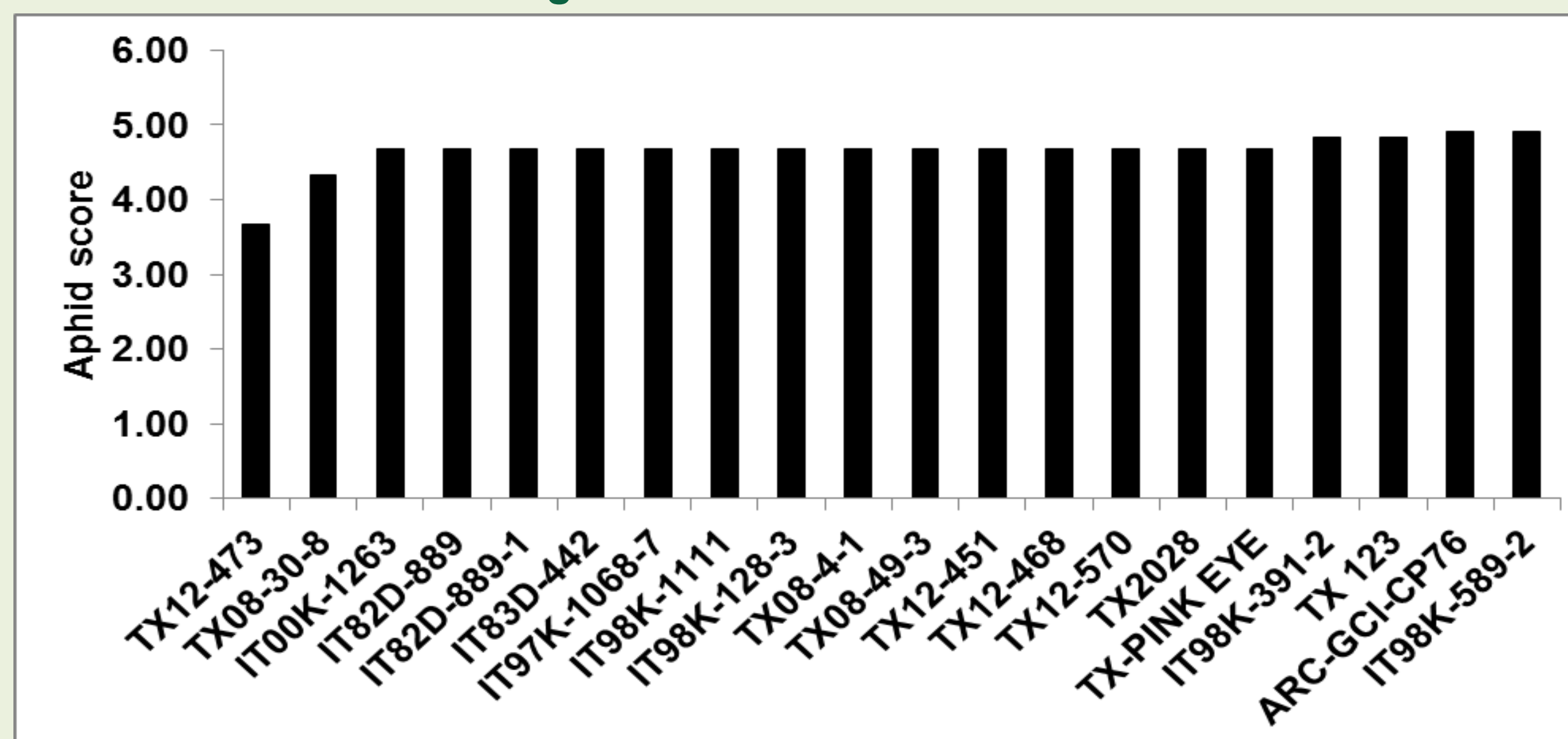


Fig. 2. Plant vigor score (3-point scale; 1 = weak; 3 = vigorous) of the 20 most vigorous cowpea varieties of 97 varieties grown in South Africa in 2013-14

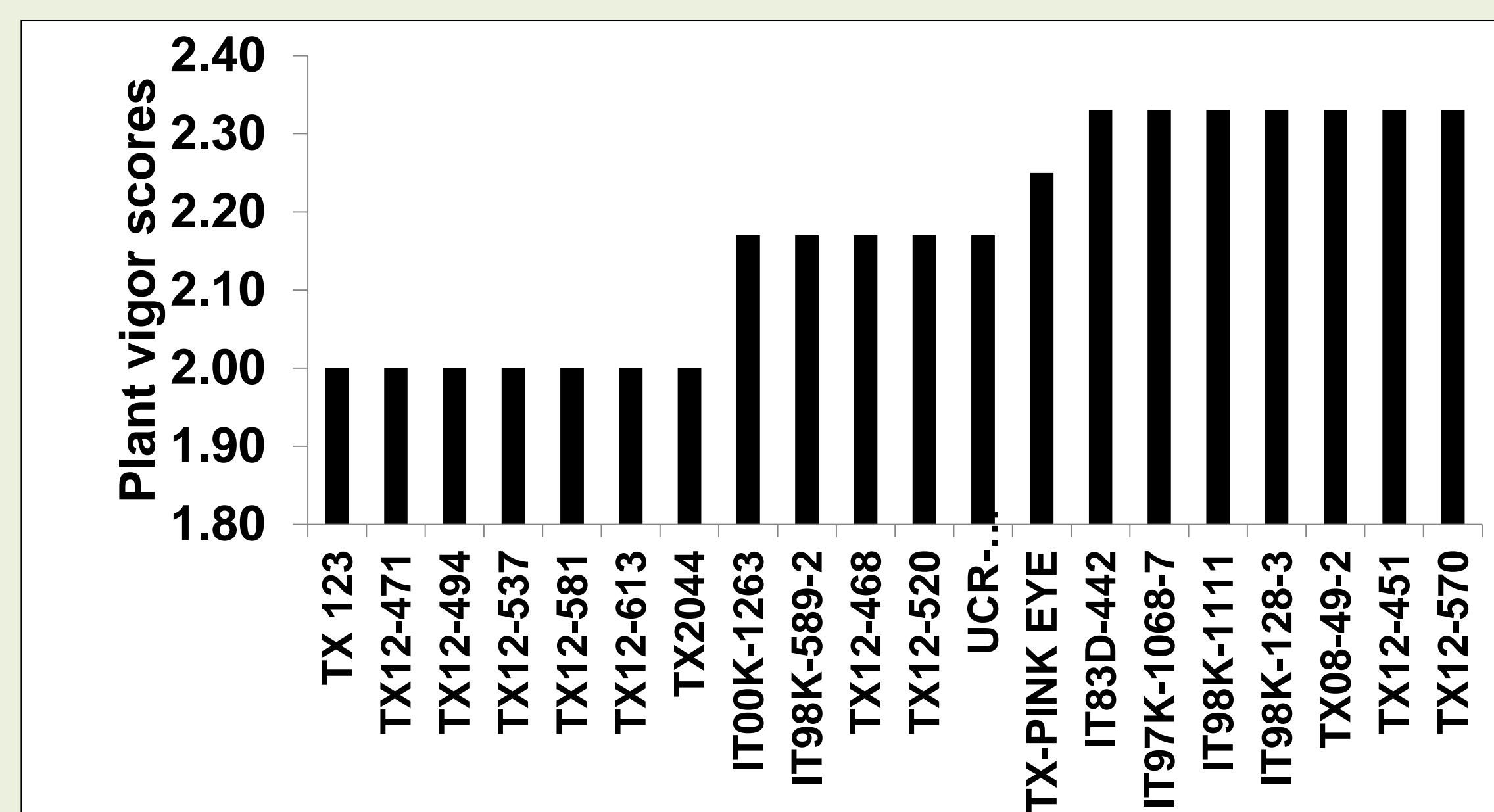


Fig. 3. Individual plant biomass (g) frequency distribution of 97 cowpea varieties grown in South Africa in 2013-14

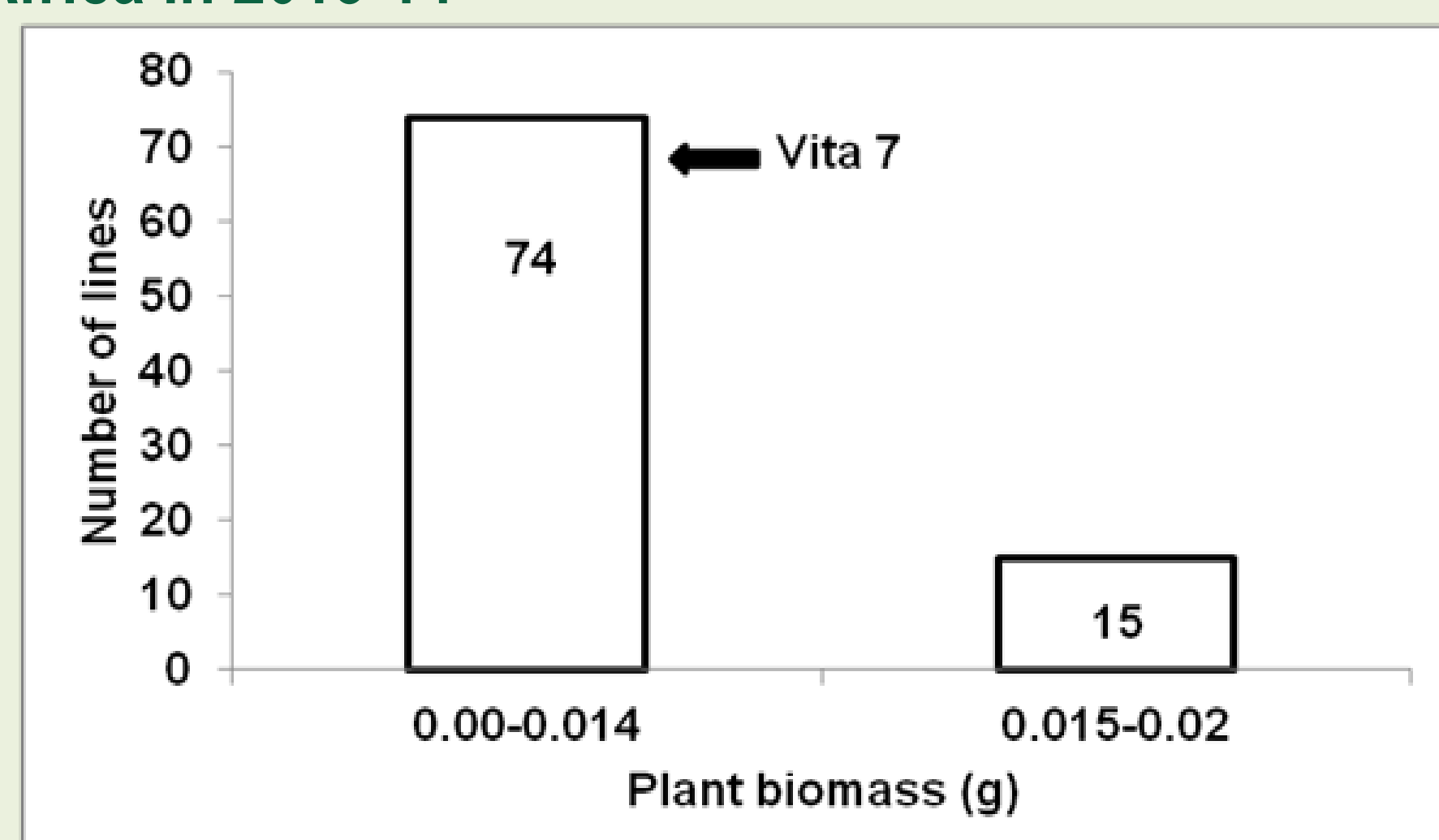


Fig. 4. Plant height (cm) at maturity frequency distribution of 97 cowpea varieties grown in South Africa in 2013-14

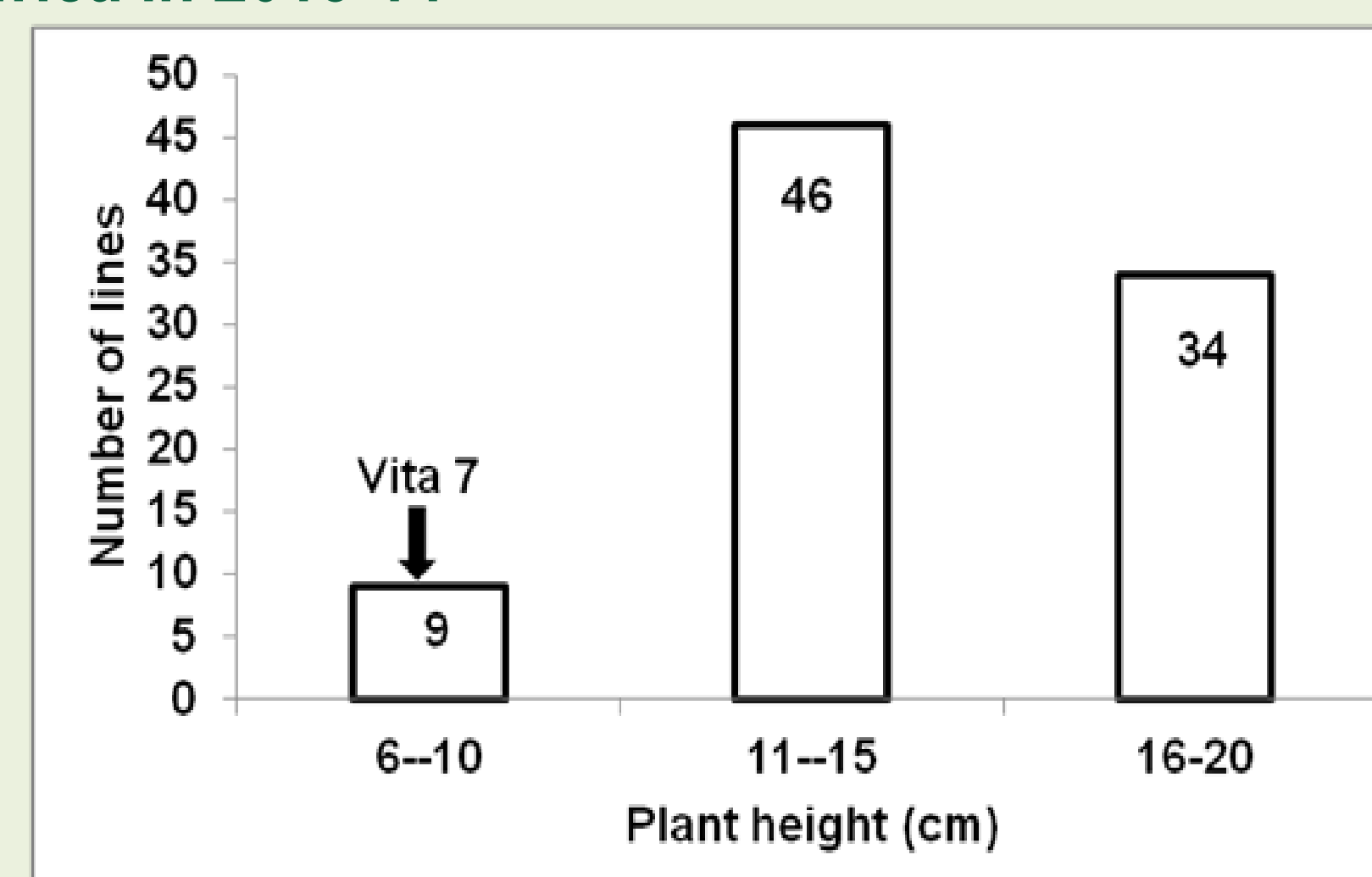
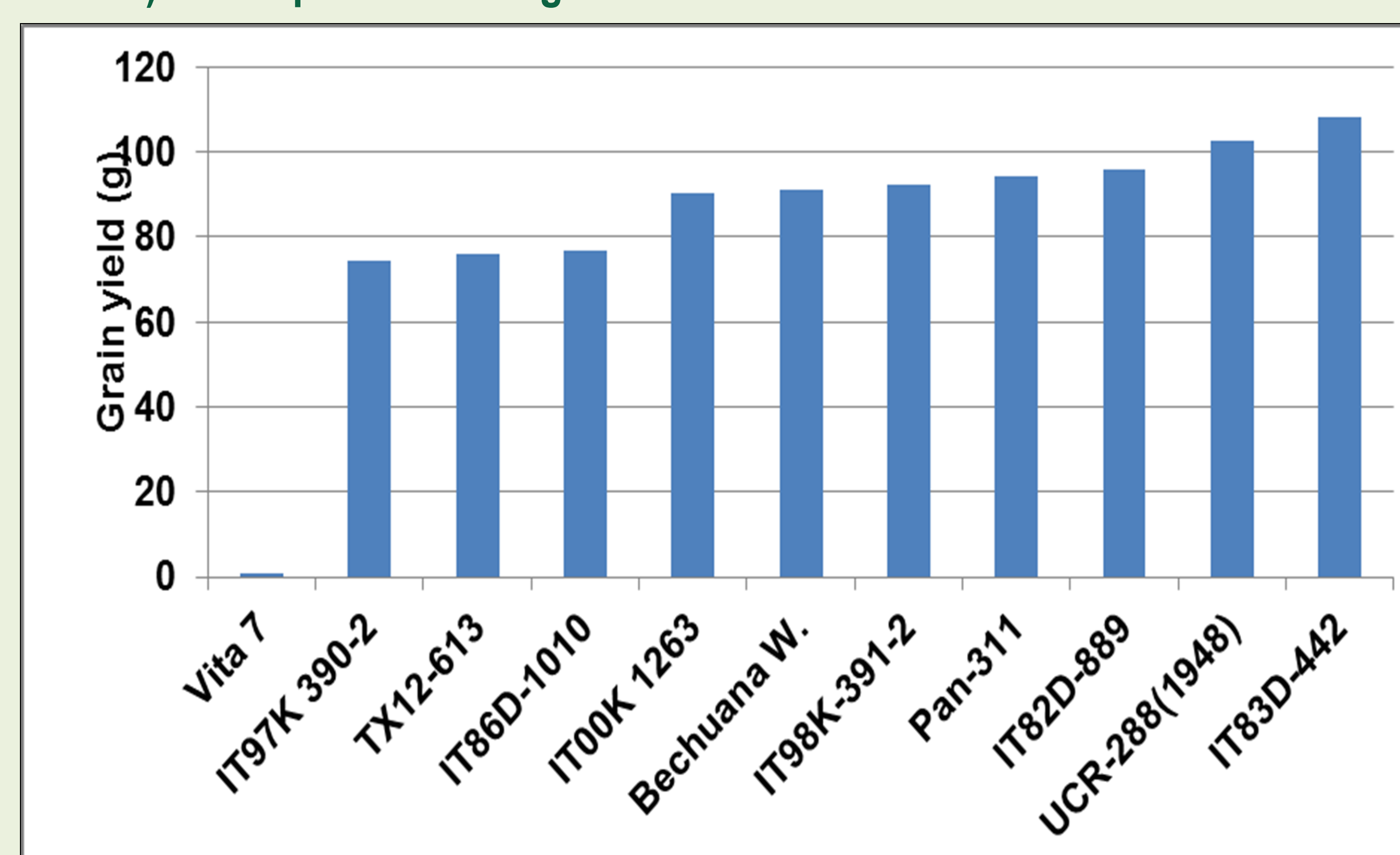


Fig. 5. Grain yield (g) of individual plants of the 10 greatest yielding lines compared to Vita 7 (control cultivar) of cowpea varieties grown in South Africa in 2013-14



DISCUSSION

Overall

- Eighty six (89%) of the 97 lines exhibited 100% aphid incidence indicating that lines were uniformly infested

Fig. 1

- Of 97 varieties, 20 exhibited aphid resistance
- The remaining 69 varieties were not different from Vita 7, which was scored as susceptible
- TX12-473 and TX08-30-8 (both TAMU breeding lines) exhibited the most aphid resistance

Fig. 2

- The most vigorous varieties were from TAMU breeding lines and IITA
 - TX12-570, TX12-451, TX08-49-2
 - IT98K-128-3, IT98K-1111, IT97K-1068-7
- 30 varieties scored as vigorous (score of 2)
- The remaining 56 lines were not vigorous and not different from aphid susceptible Vita 7

Fig. 3

- 15 varieties produced greater biomass than Vita 7 control cultivar
- 5 greatest fodder yielding varieties were from the TAMU and IITA breeding lines, and one released cultivar
 - TX12-613
 - TX2044
 - TX-Pink Eye (cultivar)
 - IT82D-889
 - TX12-581

Fig. 4

- 34 varieties grew taller than the Vita 7 control, which is a semi-erect type

Fig. 5

- The 10 greatest grain yielding varieties outperformed Vita 7 control
- Average grain yield was 40.3 g
- Vita 7 grain yield was 1.5 g, due to post-flowering pests (pod sucking bugs and pod borers)



CONCLUSIONS

- Plant biomass ($R^2 = -0.71$), plant height ($R^2 = -0.76$), and canopy height at maturity ($R^2 = -0.72$) were negatively correlated to aphid score
- Aphids had a significant effect on plant height and grain yield
- Breeding lines responded differently to aphid infestation
- Aphid damage reduced the performance of the lines
- The identified 20 resistant lines and 30 lines with promising vigor will be subjected to more intensive evaluation to validate the results obtained from this study

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