



# ROOT SYSTEM ARCHITECTURE VARIABILITY AND NITRATE REDUCTASE ACTIVITY IN WHEAT GENOTYPES FOR NITROGEN USE EFFICIENCY

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## BACKGROUND

Pakistan is a developing country with high population growth rate. Overuses synthetic fertilizers to produce more food is detrimental to environment. Pakistan ranks 4<sup>th</sup> in terms of nitrogen input, for wheat in 2014 average nitrogen input of 209kgNha<sup>-1</sup> was estimated about 64% higher than global average input rates of 127kgNha<sup>-1</sup>. The estimated NUE of wheat in Pakistan is 0.35kg N yield per kg N input substantially lower than global average value of 0.71. Selection of nitrogen (N) efficient genotypes based on N assimilating enzymes and root architectural traits are among the strategies to achieve improved nitrogen use efficiency (NUE).

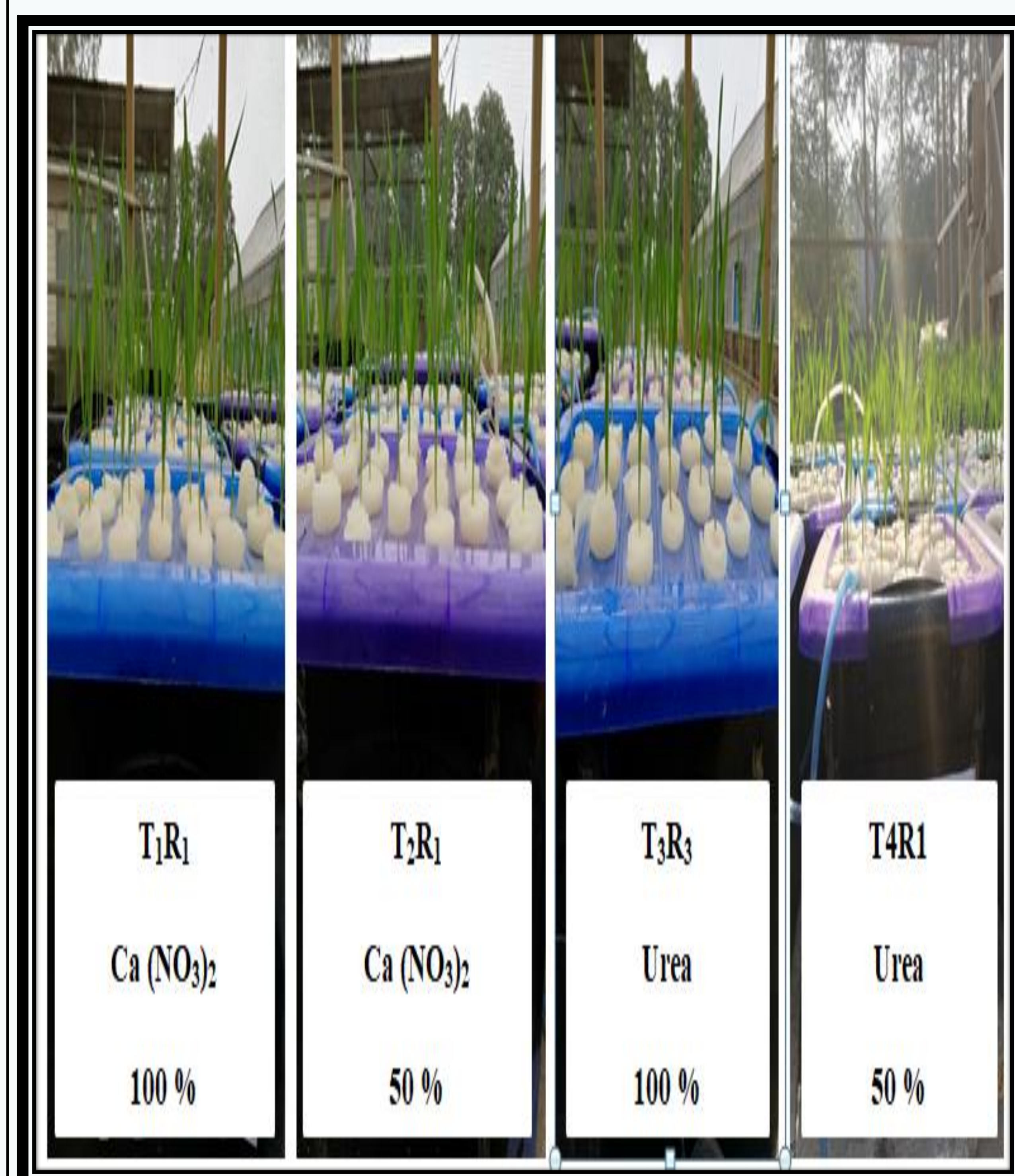
Shahzad *et al.*, 2019

## OBJECTIVES

- To compare the nitrate reductase enzyme activity at different N sources and levels.
- To evaluate the root architectural traits and NUE of wheat genotypes under different N sources and levels.

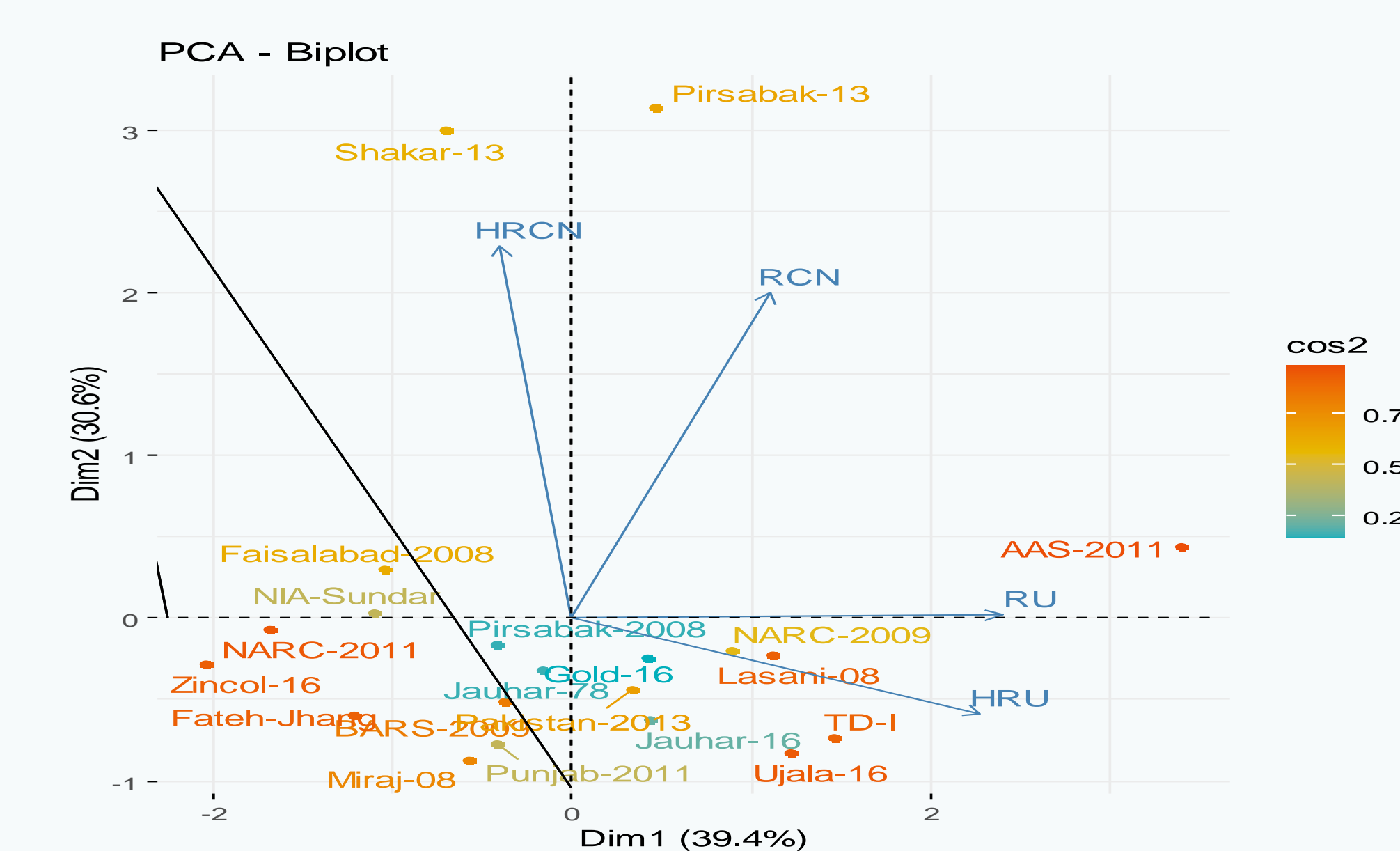
## METHODS

A hydroponic experiment was conducted in 2020 at University of agriculture, Faisalabad, Pakistan. Twenty wheat varieties were evaluated under following treatment plan. Image J based smart root software was used for the determination of root architectural parameters. Total N content in shoot and root for NUE estimation was done by kjeldahl method. Shoot Nitrate Reductase (NR) activity was measured spectrophotometric ally through method proposed by Baki *et al.*, (2000).

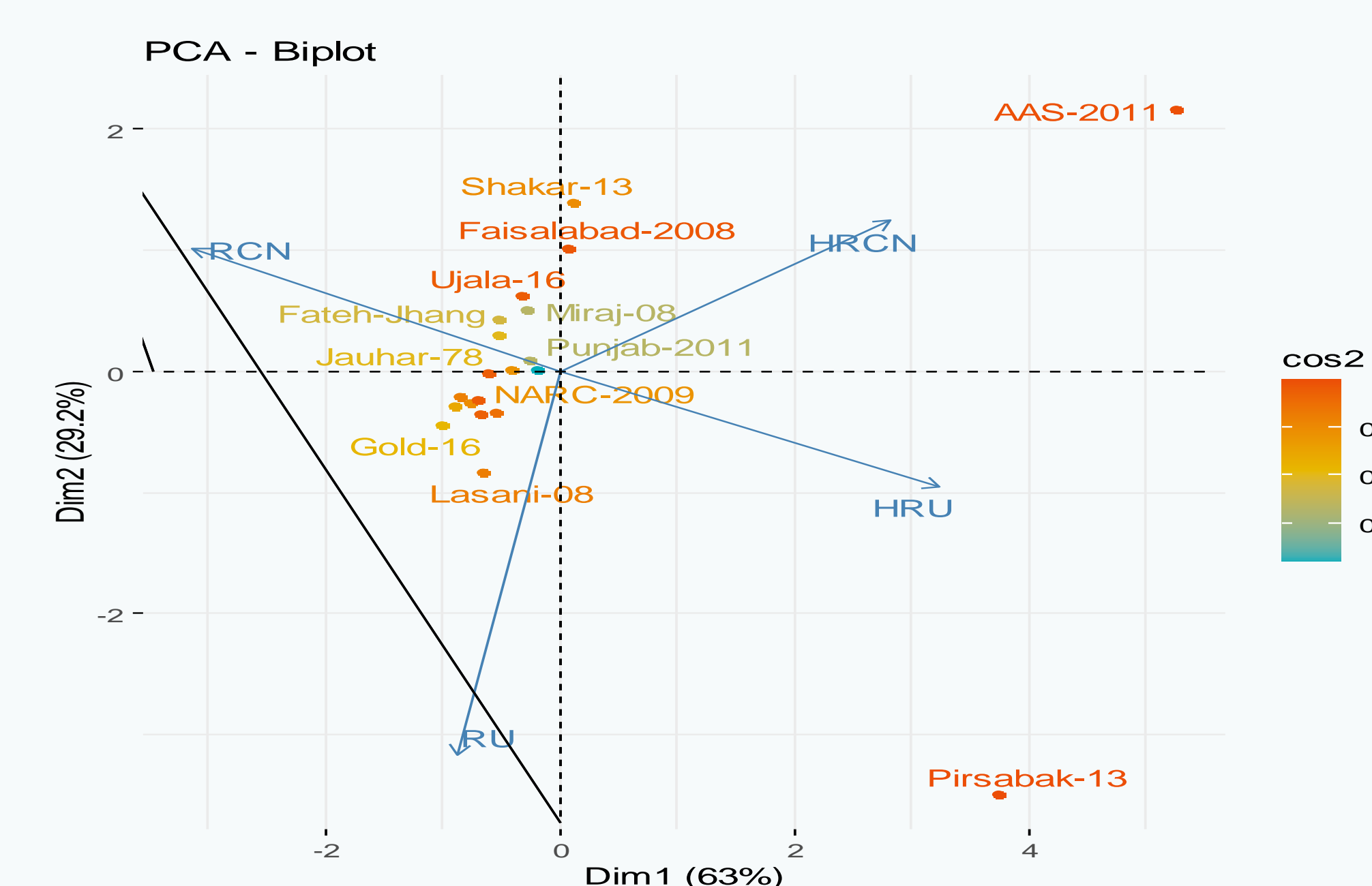


## RESULTS

Significant variation has been encountered between genotypes in terms of root system architecture, nitrate reductase activity and nitrogen use efficiency as indicated by the PCA-Biplot below. Pirsabak-13 showed the strongly significant results in all respects under 100% dose of calcium nitrate. AAS-2011 showed highest results under both 100 and 50% of applied urea. The genotype Pirsabak-13 showed the maximum NUE in nitrate source and AAS-2011 showed maximum NUE in ammonical source of N.

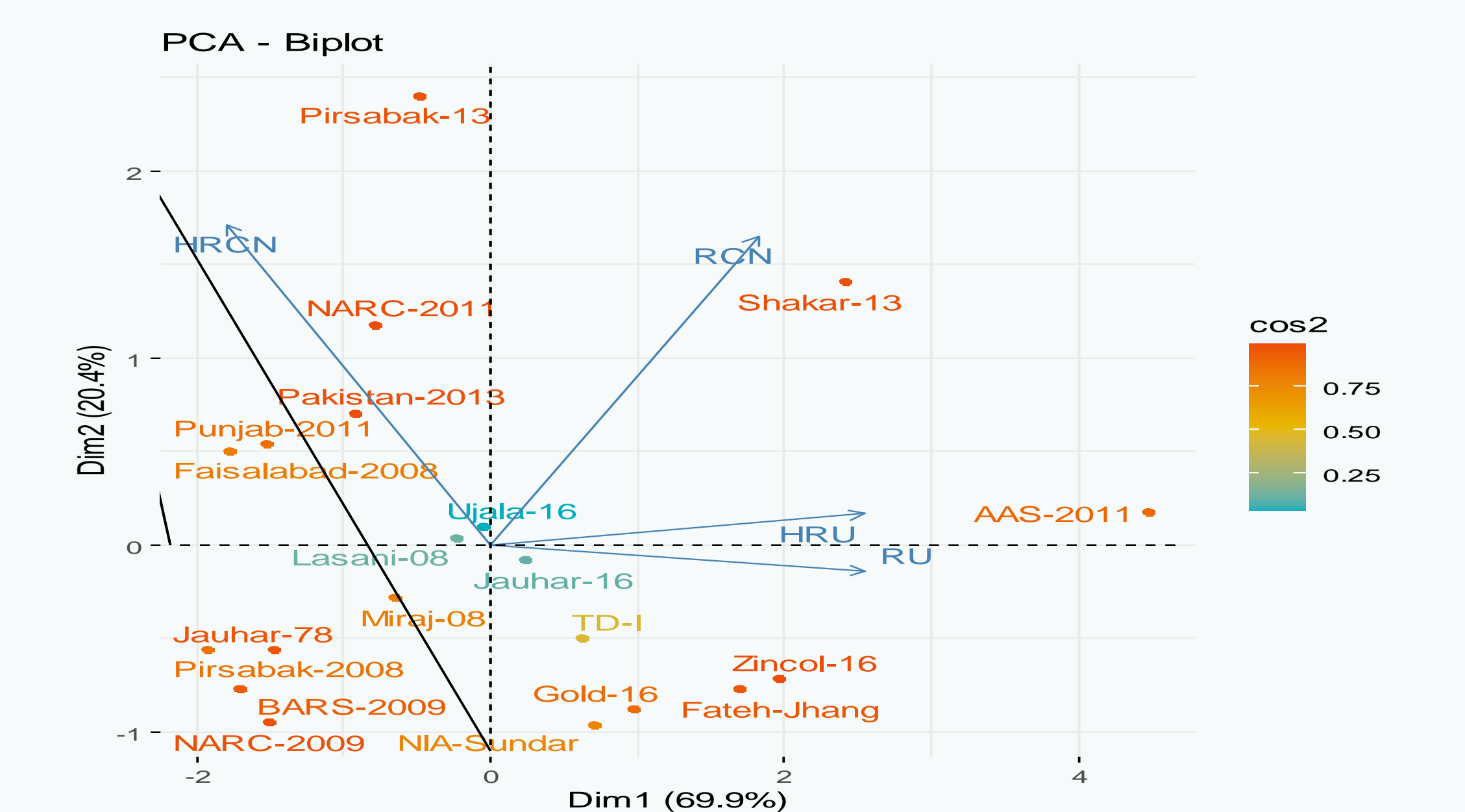


## NITRATE REDUCTASE ACTIVITY

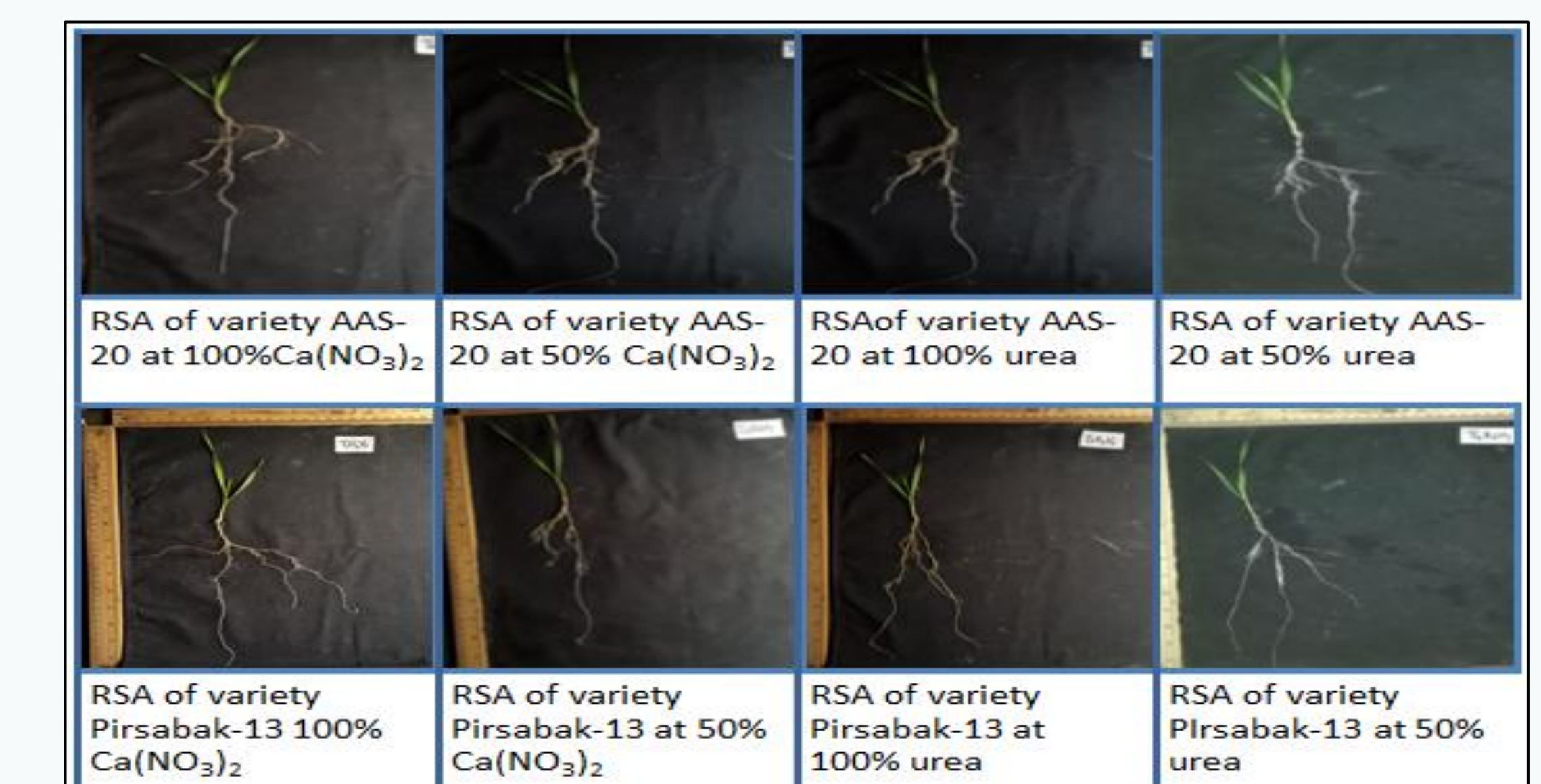


## NITROGEN USE EFFICIENCY (NUE)

## RESULTS



## ROOT SYSTEM ARCHITECTURE (RSA)



PRL= Primary root length, SLRL= Sum of lateral roots length, TRL= Total root length, RFW= Root fresh weight, RN= Root nitrogen, SN= Shoot nitrogen, NUE= Nitrogen use efficiency, NR= Nitrate reductase activity. Data are means ± SE.

## CONCLUSIONS

Improved NUE can be attributed to better NR activity and intensive root system architecture.

## REFERENCES

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