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Research Highlight

SPRING WHEAT CULTIVAR COEFFICIENTS: GENCALC VS GLUE

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Due to increasing pressure on agricultural land, food insecurity as well as climate change has made necessary to devise a proper and integrated management program in order to ensure improvement in agriculture productivity. For this purpose, strategies like crop modeling are being employed.

Crop models have been used in agriculture in several fields[1], including evaluating the effect of climate change on crop production[2], assessing cultivar performance[3], discovering the interaction between genotype and environment[4] as well as prediction of crop yield[5].

Crop simulation play a key role in simulating crop growth. Simulating the growth of a certain variety in a certain soil, climate as well as management requires particular parameters of that variety because of the genetic variations among varieties, which are known as "genetic coefficients". Accordingly, particular field experiments are conducted to estimate cultivar coefficients[6], which need sampling of growth data at intervals during the growing season. In this regard, "Genotype coefficient calculator" (GenCalc) is being employed in order to optimize cultivar genetic coefficients. The GenCalc software helps to calculate the cultivar coefficients from cultivar trial data[7].

Another program which is used to estimate cultivar coefficients is "Generalized Likelihood Uncertainty Estimation" (GLUE). While on the other hand, Decision Support System for Agrotechnology Transfer (DSSAT) is a cropping system model that possesses 2 programs for estimating particular parameters of a variety. These programs include "Genotype coefficient calculator" (GenCalc) as well as "Generalized Likelihood Uncertainty Estimation" (GLUE).

Considering these facts, scientists conducted a new research in order to simulate the effect of 3 rates of nitrogen fertilizer on grain yield as well as its components of wheat cultivar "Sakha 93" and compare GenCalc and GLUE for evaluation of the genetic coefficient of the cultivar[8].

At the end of this experiment, the results showed that GenCalc is more accurate as compared to GLUE in estimating cultivar coefficients of spring wheat, however, GLUE is easier to utilize than GenCalc. There was a significant difference found between GenCalc and GLUE in both number of grains per spike as well as number of spikes per meter square in both model calibration and model validation where GenCalc accurately predicting those parameters, while GLUE under estimated number of grains per spike and over estimated number of spikes per meter square.

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REFERENCES

1. Tsuji, G.Y., G. Hoogenboom and P.K. Thornton, 1998. Understanding Options for Agricultural Production. *Kluwer Academic Publishers, Dordrecht, The Netherlands.*
2. Mall, R.K., M. Lal, V.S. Bhatia, L.S. Rathore and R. Singh, 2004. Mitigating climate change impact on soybean productivity in India: A simulation study. *Agric. Forest Meteorol., 121: 113-125*
3. Banterng, P., A. Patanothai, K. Pannangpetch, S. Jogloy and G. Hoogenboom, 2006. Yield stability evaluation of peanut lines: A comparison of an experimental versus a simulation approach. *Field Crops Res., 96: 168-175*
4. Phakamas, N., A. Patanothai, K. Pannangpetch, S. Jogloy and G. Hoogenboom, 2008. Dynamic patterns of components of genotype x environment interaction for pod yield of peanut over multiple years: A simulation approach. *Field Crops Res., 106: 9-21*
5. Soler, C.M.T., P.C. Sentelhas and G. Hoogenboom, 2007. Application of the CSM-CERES-Maize model for planting date evaluation and yield forecasting for maize grown off-season in a subtropical environment. *Eur. J. Agron., 27: 165-177*
6. Suriharn, B., A. Patanothai, K. Pannangpetch, S. Jogloy and G. Hoogenboom, 2007. Determination of cultivar coefficients of peanut lines for breeding applications of the CSM-CROPGRO-Peanut model. *Crop Sci., 47: 607-619*
7. Hunt, L.A. and S. Pararajasingham, 1994. GenCalc. In: DSSAT Version 3, 3-4, Tsuji, G.Y., G. Uehara and S. Balas (Eds.). University of Hawaii, Honolulu, Hawaii, *pp: 201-234.*
8. Ibrahim, O.M., A.A. Gaafar, A.M. Wali, M.M. Tawfik and M.M. El-Nahas, 2016. Estimating cultivar coefficients of a spring wheat using GenCalc and GLUE in DSSAT. *J. Agron., 15: 130-135*