A Genetic Conundrum: Evaluation of a Wheat Breeding Selection Program

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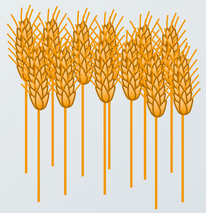
United States Department of Agriculture
National Institute of Food and Agriculture

This program was supported by Grant Program no. 2017-67032-26018 from the USDA National Institute of Food and Agriculture.

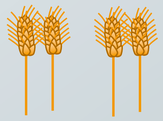
APPLIED PLANT SYSTEMS EXPERIENTIAL LEARNING PROGRAM

Background



Wheat is the most widely grown crop in the world.

Wheat needs to be bred with herbicide resistance. The presence of weeds encroach upon and compete with wheat thus lowering productivity.

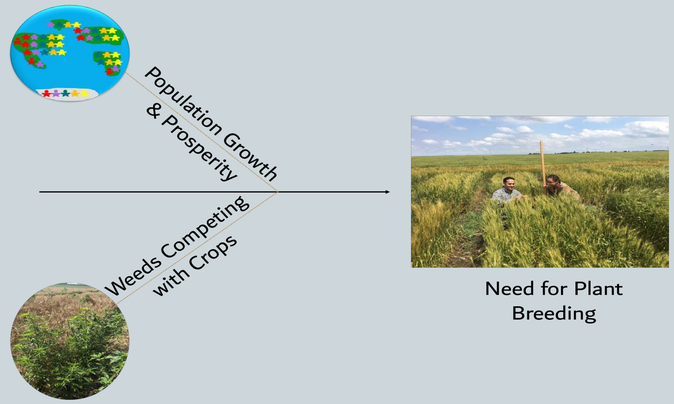


Using two herbicide-resistance genes, crosses were made and are as follows: CCFf x CCFF, CcFf x ccff, CCff x CCFF, [CCff x ccff] x CCFF, CCFf x CCff, Ccff x CCFF.

Development of Herbicide-Resistant Wheat through the Use of Conventional Breeding

Objective

Although the headrows should show very miniscule amounts of damage by herbicide, a significant number of plants appeared to be damaged after application. This means that many of the plants did not have the anticipated resistance. The purpose of this study is to perform a statistical comparison of the projected resistance versus the observed resistance wheat in headrows.



Methods

Healthy	Stunted/ Damaged
	

Visual inspection of herbicide resistant headrows. Thirty populations given a score of healthy or stunted/damaged.

Results

	Observed (O)	Expected (E)	(O-E)^2/E
CCFF x CCff Healthy	16	34.125	9.626
CCFF x CCff Damaged	62	43.875	7.4875356
		χ2 Value	17.113536

	Observed (O)	Expected (E)	(O-E)^2/E
CCFF x CCFF Healthy	61	280.3125	171.58697
CCFF x CCFF Damaged	329	109.6875	438.500036
		χ2 Value	610.087006

	Observed (O)	Expected (E)	(O-E)^2/E
CCFF x CCff Healthy	51	102.375	25.781593
CCFF x CCff Damaged	183	131.625	20.05235
		χ2 Value	45.833944

	Observed (O)	Expected (E)	(O-E)^2/E
Ccff x CCFF Healthy	191	283.2375	30.037535
Ccff x CCFF Damaged	667	574.7625	14.802212
		χ2 Value	44.839747

	Observed (O)	Expected (E)	(O-E)^2/E
CcFf x ccff Healthy	20	8.686364	14.73555098
CcFf x ccff Damaged	136	147.3136	0.868877992
		χ2 Value	15.60442897

	Observed (O)	Expected (E)	(O-E)^2/E
CCFf x CCff Healthy	32	51.1875	7.192384
CCFf x CCff Damaged	202	182.8125	2.01386752
		χ2 Value	9.20625153

	Observed (O)	Expected (E)	(O-E)^2/E
Ccff x CCFF Healthy	173	128.7443	15.212844
Ccff x CCFF Damaged	217	261.2557	7.4967435
		χ2 Value	22.709588

Perform a χ^2 analysis

Conclusion

The results demonstrate that there is a significant ($p \leq 0.01$) discrepancy between the anticipated resistance of the headrows and what has been observed. These results suggest that there may be a need to improve selection methods for herbicide resistant wheat.

Acknowledgements

I would like to thank the University of Nebraska-Lincoln Summer Research Program. A special thanks to the laboratory of Dr. Baenziger for their continued support. I would also like to thank the McNair Scholars Program.