Stepping Out of the Iowa 'Box'

A Glimpse of Mexican Culture and the Future Of Meeting World Food Demands

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By Emily Nieman

"If you are going to be here long, you'd better learn to eat rice, but I really don't care for rice- I'd much rather eat a bowl of potatoes."
-Dr. Norman Borlaug

As I heard Dr. Borlaug speak these words at supper one night I realized his roots were still deep in Iowa, and so were mine. Both growing up as meat and potato children, we had learned to appreciate such small things as a bowl of potatoes. Although I may have eaten rice quite frequently, I was not stationed in The Philippines working at IRRI in the rice paddies; I was stationed at The International Maize and Wheat Improvement Center (CIMMYT) near Mexico City, Mexico. While at CIMMYT I worked in the Maize Program under Dr. David Beck, senior scientist and maize breeder of the Highland Maize Program. Eating a bowl of rice at every meal was just one of the many differences I noticed while living in Mexico.

As I boarded the plane from Atlanta, Georgia, to Mexico City, I encountered my first major barrier, the language. As soon as I learned that I would be stationed in Mexico, I was a little nervous because I had never studied Spanish. Immediately, I began studying the language; however by the time I got to Mexico, I could only remember

"Hola, Como estas?" and if I were lucky "Bien y Tu?" As I sat in the plane waiting to take off, all I could hear was Spanish: instructions in Spanish, conversations in Spanish, and, as the plane took off, children crying in Spanish. This was just a preview of what I would experience in the coming months.

The culture of Mexico is occasionally referred to as the 'imported' America. This was very evident by the Brittany Spears and Camel cigarette advertisements hanging throughout Mexico. Unlike America, however, there was a level of poverty that I had never before seen. Stopped at a traffic light in Mexico City, a small boy began to walk on his hands in front of all the cars. I reached my hand out of the car window and gave him a few pesos. This boy had no shoes, no shirt, and was wearing a pair of old shorts. All I could think of was the fact that I was sitting inside a red Volkswagen Bug, had more than enough to eat for supper, and was not getting wet in the pouring rain. Many times little children would stand in the street attempting to sell fruit, wash the car windows, or perform magic tricks just for a few pesos. In the coming weeks, I would experience a great deal more of Mexico's culture.

Of the many things I was able to see, the markets were my favorite. The first marketplace I saw was under a bright cherry-colored tarp with fresh produce for sale. Sounds of squawking chickens about to be slaughtered by the their owners filled the marketplace. Along with the noise of children laughing and crying waiting for their mothers to finish their daily trip to the market. The wonderful smell of fresh vegetables and fruit as well as the putrid stench of rotten chicken meat left in the sun too long drifted through the air. Green cactus leaves and brilliantly colored peppers lay along the tables of goods. Vendors, attempting to lure costumers to their produce, yelled out bargains. Beggars and stray dogs sat outside the market, hoping for a good soul to drop a bit of food. Around the bend of the cracked cement road, lay another market. Before reaching the market I could hear the sound of the children and vendors. Nearing the market, I could see a brilliant yellow tarp as radiant as the sun held up by four, crooked, posts, hanging above the vendors. Along the sidewalk homeless children attempted to sell tiny packets of chewing gum and freshly cut red roses. The sad, puppy dog eyes, worn clothing, and dirty hands touched my heart and reminded me, once again, how thankful I was for what I had. Inside this marketplace lay artwork, blankets, and other goods created by the Mexican vendors. Woodcarvings of vibrantly colored creatures created by the mountainous Indian tribe, Oawaxca, appealed to the eyes of many. Vivid stone masks and stone carvings, advertised as Aztec artifacts, also drew many sales. As the morning turned to noon, more and more people packed under the brilliant yellow tarp, all hoping for the best bargain. I always enjoyed bargaining with these vendors; with the exception to the bargain that one amorous vendor gave me; " This beautiful piece of art for only one US dollar and your love to me!" I was very thankful that my friends pulled me away from this horrible predicament!

Mexican Vendors

Meals in Mexico are served with limes, salt, and salsa.

As a clever person once said; "There are two things a person should go at with reckless abandon, food and love." This proved to be very true while in Mexico. Before going to Mexico, I disliked most Mexican food. In the beginning, I was a little apprehensive about the food I ate. However, by the time I left I had learned to love this delicious Mexican cuisine. Cacti were an interesting food I was able to try. In the markets it would be common to see cacti leaves for sale. As a wise Mexican told me before I tried them; " You may not like them, but they are good for the heart." Tuna, fruit from cacti, was very commonly sold along the road at roadside stands. Many times people would stand in the road flashing tuna or other fruits at the driver, attempting to make a sale. This fruit, like much of the tropical fruit, tasted delicious. Of the many places to buy food, my favorite place was at one of the taco shops, very common along the streets. Several advertised one taco for one peso, approximately ten US cents. However, we were advised to eat at shops with tacos for seven pesos each, assuring that the meat was really beef; not a stray dog on the street. We sat on wobbly, old wooden stools as a

young Mexican girl took our orders. The older Mexican woman gathered the meat and placed large, thin pieces of light pink, unidentified meat on the skillet. Placing the browned meat on a stump of a tree, the woman quickly chopped the meat into tiny pieces and placed the mutilated meat on the tortillas. After receiving our meals, we poured a variety of colorful sauces over the meat, rolled the tortillas around the meat and ate the delicious Mexican tacos. Outside the building we ate in, small homeless children would stand asking for food. Often we would give these children what we did not eat.

Taco stand located near Taltizapan, Mexico

As I noticed such things as the beggars and poor farmers in Mexico, the work I did at CIMMYT was put more and more into perspective for me. Although I did not have a huge hand in solving the world's problems, I felt as if I had the chance to see the opportunities that lay before me for my future in helping the world.

House near Tlatizapan

At CIMMYT I was able to work in many of the programs that were offered. Many of these experiences have changed my view on agriculture and on how we can solve food security problems. While science is vital to solving problems related to food security, the preferences of those who will be using the science, the farmers, must be taken into consideration. As Scott McLean, CIMMYT geneticist/breeder, said; " You cannot throw a wonder crop at an African farmer and expect him to grow it- you must develop a crop which the farmer will accept and grow on his farm."

From 1990 to 1998, about 30% of the world's children under five years of age were moderately or severely underweight. Many of these children rely on maize as their primary food source. By the year 2020 the demand for maize in the developing countries will surpass the demand for both wheat and rice, making maize the most important cereal crop in the world. It is the goal of the Maize Program at CIMMYT to develop maize that will help meet this demand.

I

El Batan- Headquarters of CIMMYT

Throughout my stay in Mexico I lived at the headquarters of CIMMYT, El Batan, the highland substation; was also able to travel to the Tropical and Subtropical substations of Mexico. Not only did this allow me to travel other areas Mexico; I gained a clearer understanding about the goal of CIMMYT and the Maize Departments' role in reaching this goal. Through my travels in Mexico I experienced even more events out of my 'Iowa' box.

During my first experience in the field, I encountered many challenges that made me wonder just what on earth I was doing in Mexico. After speaking with Dr. Beck, we decided that I should see all components of the Maize Program. Subsequently, my first assignment would be detasseling in the field for one day. As my grandpa once said, " An Iowan who has not detasseled cannot be called a 'true' Iowan." My grandpa chuckled when I told him that I had detasseled my first corn plant in Mexico, not in Iowa.

Lacing my shoes up that morning, I could not hide my excitement; although at the same time I could not forget the horrible stories my friends told after coming back from a summer break of detasseling. After receiving instructions in English from Dr. Beck, I was left in the field for the day with four men who only spoke Spanish. As I walked through the rows, I realized my feet were beginning to get wet; soon there was a stream of water between my feet, and before long I was ankle deep in a river of muddy water. Considering I couldn't ask anyone what was going on (my Spanish hadn't improved), I needed to use my "Iowa farm girl" common sense. I looked down the rows and decided that this "river of water" was not a flood from nowhere, but irrigation, something that this Iowa farm girl had never experienced; however, I had seen pictures and read about this "automatic rain". I must say, even though by the time I was done I was up to my knees in mud and exhausted, I had learned a great extent about detasseling, a little Spanish, and was curious to see more of what CIMMYT was involved in.

Detasseling Mexican Maize

CIMMYT is involved in a worldwide research program for maize, wheat, and triticale. The research done at CIMMYT will be used to help those in developing countries. The main goal of CIMMYT is to improve the livelihoods of the poor by ending their hunger, raising their incomes, preserving their land and other natural resources, and helping their children to a better life. While at CIMMYT, I was made aware of the problems relating to food security and had the opportunity to work hands-on in the research field with scientists from the many different programs of CIMMYT. This opportunity has broadened my horizons and shown me a life outside my "Iowa Box".

I spent the majority of my time at El Batan, the headquarters and highland station of CIMMYT. El Batan, 2,309 meters above sea level, had a very cool and dry climate. This was very different compared to the hot and humid Iowa summers I was used to. Although it was cool, I was still very close to the sun, and with fair skin I needed to apply plenty of suntan lotion. Due to the fact the headquarters of CIMMYT was located in the highlands, I was able to not only work in the fields but also the labs located in El Batan.

When asked if I would like to travel to Tlaltizapan, the subtropical substation, I jumped at the opportunity. Tlatizapan, 940 meters above sea level, felt about the same as a hot and humid July day in Iowa. As we entered the town of Tlatizapan, donkeys carrying produce on the road and shacks where people lived began to put CIMMYT's goal into perspective for me. After we arrived at the substation, we first organized the seeds that were to be planted that day, and then we began the task of planting the seeds, by hand. Other than Carlos and Zach, all other workers in the field spoke Spanish. Due to the lack of my Spanish speaking skills, I relied on hand motions to communicate with the workers, which must have been very entertaining for them. While in the field, the workers called me Amelia, Emily in Spanish, a name that would stick with me for the

Planting maize in Tlatizapan, Mexico

remainder of my internship. Planting seeds by hand was hard labor; however, the experience was irreplaceable.

Dr. David Bergvinson speaks with Director General Masa Iwanaga

I had the opportunity to travel to the tropical substation for an informational field day for the new Director General, Dr. Masa Iwanaga. Due to the fact that a flood destroyed Poza Rica, the past tropical substation, CIMMYT recently purchased land in Aqua Fria. After being in the much cooler, drier, Mexican highlands, Aqua Fria, only sixty meters above sea level, was quite a change; when I stepped out of the car I wondered if I should breath or drink the humid air. During this field day I learned of the many projects taking place in the Tropical Program and their role in helping to achieve CIMMYT's goal.

The trip home from Aqua Fria provided an unexpected adventure. The nearest city to CIMMYT, Texcoco, around five minutes from CIMMYT and forty-five minutes from Mexico City, is soon to become a suburb of Mexico City due to the urban sprawl. The airports of Mexico City, no longer able to expand, chose an area close to Texcoco as the place for expansion. A problem developed, however, the farmers in the area did not want to give up land to the government that had been in their families for generations. Soon protests began to take place, most of which were far away from where I lived. One day, however, a group of rioters blocked of a major road from Mexico City to Texcoco. This caused CIMMYT to close for the day. Also causing those of us in Aqua Fria to take a two-hour detour up the mountain in a purple suburban to return to CIMMYT. That day I realized that even though these Mexican farmers may be poor, their heritage means more than money.

My idea of how to feed the world was dramatically changed on the day I spoke with Scott McLean. I realized that there was much more than just discovering the 'miracle' crop through biotechnology. In my Iowa 'box' where all corn is yellow, I was suddenly told that most people eat white and some Africans would rather feed yellow corn to their cattle and starve than eat yellow corn. Also in my box I had always thought that if it were proven to be safe, you could eat it. I could not understand how religious beliefs, a farmer's pride, or the belief in witchcraft could stop a hungry person from eating. That day I realized that neither money nor seeds could be thrown at those who are hungry; person-to-person contact is vital in solving food security issues.

By the year 2050 the world's population will likely increase to approximately ten billion people. Through biotechnology, scientists may produce plants that grow under tough conditions such as extreme heat, dry or poor soil, areas of flood, or other land considered difficult for farming. Biotechnology will help farmers produce more crop from the existing land while sustaining the land's ability to support continued farming. Not only will it improve the yield of a crop, biotechnology has the potential to improve the nutrition of a crop. For example, biotechnology has produced "golden rice," a rice enriched with beta-carotene and iron. This may help young children in developing countries obtain levels of Vitamin A needed to prevent serious problems with vision.

Through my experience with CIMMYT and the Biotechnology Department, I had the opportunity to speak with leaders in the biotechnology field, work with in the lab department, and learn about biotechnology's role in the future.

Biotechnology has become a major issue in today's world. A key supporter of biotechnology has been Dr. Norman Borlaug. I was able to speak with Dr. Borlaug on many occasions during my stay. Whether it was at supper in the cafeteria or walking through the office building, Dr. Borlaug always had time to say hello to me. Through my discussions with Dr. Borlaug, I realized that this man who helped to start the Green Revolution and had won the Nobel Prize was just a normal person. He even makes mistakes such as locking his keys in his house. Dr. Borlaug's original goal was to become a teacher and coach at the high school level. However, as the twists and turns of life go, Dr. Borlaug ended up at CIMMYT as a wheat breeder. Through his dedication and hard work ethic, he was able to develop wheat that would help those who were starving. On the last day of my internship Dr. Borlaug invited me to his office. As I sat in his office, I looked behind him on the wall; this wall was full of the many awards this man had received. Among those hung the Nobel Prize Award. As he spoke, I realized that this man has won many awards and honors. In fact, there is a special building at CIMMYT named after him, a mural on which his face is painted, and the list of recognition goes on and on. However, he is still a down to earth man who really cares about what he does. His advice to me was to stay educated on a wide range of areas; " Look at all the doors of opportunities, do not focus on just one door as that door may not open; in fact the door you least expect could open."

Working with the Larger Grain Borer

After a few weeks of working in several of the labs around CIMMYT, I was able to choose where I would like to conduct my research project. After looking at my options, I decided that the entomology lab provided me with a project that met my time requirement and interests. My first experience in the entomology lab included a basic tour of the facilities. All the moths, eggs, bugs, and other creepy-crawly things amazed me. I couldn't wait to see which of these insects I would work with. In the end, I was able to work with the majority of them. My main job was sifting the jars of maize. This consisted of emptying a jar of weevil-infected maize onto a sieve, shaking the sieve until the flour, maize, and weevils were separated, weighing the flour and maize, and finally counting the weevils. In the lab, all of the men spoke Spanish. I often worried that I had interpreted the hand-signals incorrectly and had ruined the research projects.

My final research project involved Quality Protein Maize (QPM) and the Larger Grain Borer (LGB); the research that I helped to conduct involved genetic differences in QPM Maize lines and their resistance to the Larger Grain Borer.

Scientists at CIMMYT developed QPM, maize that looks and tastes like normal maize but has nearly twice the lysine and tryptophan, essential amino acids, as normal maize. In 2000, Dr. Surinder Vasal and Dr. Evangelina Villegas were awarded the World Food Prize for their work with QPM. These two scientists still live and work at CIMMYT. I had the opportunity to speak with Dr. Viellagas at

Dr. Vasal giving presentation in Tlatizapan, Mexico

breakfast and traveled to Tlatizapan with Dr. Vasal. Maize is a major food source for millions of the poor in Africa and Latin America. Their diets often lack proteins and other important nutrients. QPM is not only used for human consumption; pigs gain approximately twice the rate of those fed normal maize. By giving farmers credit to buy pigs and raise them on QPM, a government program in Guizhou Province, China, earned enough money to build houses, increase their inadequate food supply, and begin community development activities. QPM is historically known for its soft endosperm, making it susceptible to storage pests. Storage pests, such as LGB, pose a major problem in the tropics and subtropics, where hot, humid weather encourages the growth of these insects. Many poor farmers who cannot afford a storage bin store crops in pottery bowls underground where it is cooler. Many of these farmers also plant the harvest from their previous year, making the storage of their crop vital to their livelihoods. In my research I was able to evaluate data taken on nineteen varieties infested with LGB. See appendix A for my results.

Through my internship at CIMMYT, my goals for the future have become more defined. In the future, I hope to attend college and major in Biochemistry and International Agriculture. This internship has also helped to refocus my senior year in high school as a student by showing me where hard work and dedication lead. In addition, my travels to Mexico have motivated me to continue traveling internationally through other programs. I will forever be thankful to the World Food Prize Foundation for providing me this opportunity that changed my life.

When I participated in the World Food Prize Youth Institute in 2000 and 2001, never in my wildest dreams did I ever imagine that I would spend my summer of 2002 in a foreign country with research scientists from around the world. This opportunity gave me, a farm girl from the small town of Delhi, Iowa, the opportunity to see a world outside my Iowa 'Box'.

Appendix A

Genetic Difference in the Resistance to the Larger Grain Borer, *Prostephanus truncatus* (Horn) (Coleoptera: Bostrichidae)

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Abstract

Within Quality Protein Maize there are varieties, some of which may be resistant to the larger grain borer, Prostephanus truncatus (Horn) (Coleoptera: Bostrichidae); when these varieties are found they may be used to develop a crop with high yield, good nutritional value, and resistance to the Larger Grain Borer (LGB). Infestations of nineteen QPM varieties were made under controlled conditions. The results showed that there are some varieties of QPM that are more resistant to the Larger Grain Borer. In addition, there were high correlations found between Percent Maize Loss, Number of Adult Weevils, and Flour Weight. Thus, genetic difference and resistance to the Larger Grain Borer could be found.

Introduction

By 2020 the demand for maize will have passed both wheat and rice making maize the most important crop for food. This increase in demand will need to be met through farmers increasing their yield. Many farmers in the developing countries use grain from their previous harvest as seed for the next year, making the storage of their grain vital to their livelihood. Quality Protein Maize has been developed as a more nutritional grain-thus with great potential to help the malnourished. However, QPM is historically known for having soft endosperm and associated high susceptibility to storage pests, such as the Larger Grain Borer. By finding varieties which are resistant to storage pests farmers will be able to grow a crop that is nutritious and has the ability to be stored for next year's planting.

Materials and Methods

The screening of maize for resistance against the LGB was done in the Entomology laboratory at the International Maize and Wheat Improvement Center's headquarter, El Batan Mexico in 2000. The insects used in the study were obtained from a laboratory stock culture of LGB maintained on susceptible 'floury maize', Cacahuacintle. For advancing lines from on generation to another, the plants were grown in CIMMYT's tropical station at Aqua Fria (20.2606º N, 97.4303º E, 60 meters above sea level). For planting, row-to-row and plant-to-plant spacing was 75 and 25 cm, respectively. The plots were fertilized with nitrogen at 150 kg/ha in split doses of half before planting and half six weeks later. Several experiments were conducted in the laboratory to screen QPM's fro resistance against LGB. The ears were harvested, dried and frozen for five days. Each selected ear was than shelled. 30 grams of grain were placed inside a glass jar (50ml capacity) and infested with 25 adults of the LGB. Three replications of each QPM line were made and evaluated for damage two months after infestation. The powder production caused by LGB feeding was rated in relation to that produced on susceptible Cacahaucintle. Grains and LGB adults were separated by sieving the powder and grains through sieve no.10 (mesh 2.00mm). The numbers of adults were record along with the weight of the flour and damaged maize. Frequency distributions were computed for grain damage, powder production, and number of adults each QPM infested with LGB. Correlation coefficients were determined between grain damage and powder production and number of adults recovered.

Fig. 1 Maize infected with  *Larger Grain Borers*

Results and Discussion

Eighteen QPM varieties were tested for resistance to LGB. The following table contains the means and standard deviation factor of each line.

QPM Varieties and Means

		Weevils	S.D (+/-)	Flour	S.D.(+/-)	%Losses	S.D. (+/-)
Tropical Adanced Late White Single Crosses, Normal & QPM	**TSCLW01-01**	42.487	18.217	4.2066	1.6877	18.206	8.1044
Tropical Advanced Late Yellow Single Crosses, Normal & QPM	**TSCLY01-02**	33.824	10.411	4.1477	1.4679	17.606	6.7022
CIMMYT Hybrid Trial- Tropical Yellow QPM	**CHTTYQ-03**	44.938	16.704	3.8205	1.8072	16.46	8.4463
CIMMYT Hybrid Trial- Tropical White QPM	**CHTTWQ-04**	47.875	17.973	3.8859	1.5552	17.167	7.268
Tropical Advanced Late Yellow Single Crosses, Normal & QPM	**TSCWQ01-05**	48.611	19.497	5.2804	1.7381	23.286	8.2848
Tropical Late White QPM Single and Three Way Crosses	**TSCWQ01-26**	64.112	28.404	4.8593	2.2019	21.66	10.551
Tropical Late White QPM Advance Generation Single Cross	**TSCWQ01-27**	38.089	15.518	2.7192	1.2931	11.258	5.8295
Tropical Late Yellow QPM Single and Three Way Crosses	**TSCWQ01-28**	34	13.743	3.9824	1.5419	16.957	7.0362
Tropical Late Yellow QPM Advanced Generation of Single Crosses	**TSCYQ01-29**	33.955	14.982	2.422	1.8904	11.053	8.3437
Tropical Early Generation Test Crosses-S3 Lines Late White QPM Group "A"	**TSCWQ01-30**	37.86	21.116	3.5512	2.3556	15.98	10.797
Tropical Early Generation Test Crosses-S3 Lines Late White QPM Group "B"	**TSCWQ01-31**	61.096	32.11	6.1484	1.864	27.323	9.1132
Tropical Early Generation Test Crosses-S3 Lines Late White QPM Group "AB"	**TSCWQ01-32**	44.611	20.77	6.3606	1.9479	27.885	8.8996
Tropical Early GenerationTest Crosses-S3 Lines Late White QPM. Group "AB"	**TSCWQ01-33**	33.08	11.766	4.063	1.2935	16.523	5.8895
Tropical Early Generation Test Crosses-S3 Lines Late White QPM	**TSCWQ01-34**	31.437	10.675	3.3718	1.4778	14.132	6.535
Tropical Early Generation Test Crosses-S3 Lines Late Yellow QPM Group "A & B"	**TSCYQ01-35**	39.237	16.545	4.7173	1.6613	19.669	7.6363
Tropical Early Generation Test Crosses-S3 Lines Late Yellow QPM Group "A & B"	**TSCYQ01-36**	47.898	25.422	5.027	2.0692	22.579	9.9379
Tropical Late White QPM Single and Three Way Crosses	**NCHWQ01-37**	45.133	18.506	3.6042	1.6761	14.731	7.1128
Tropical Late White QPM OPV's & Synthetics	**NCHWQ01-38**	32.078	9.0096	3.8119	1.5192	15.964	6.992
CIMMYT Hybrid Trial - Tropical Yellow Non-Conventional Hybrid and Synthetic	**TSCWQ01-39**	32.021	9.2862	3.5251	1.3685	14.543	6.0723

Fig. 2 Table of QPM varieties screened against LGB used in project. Included are means of number of adults found, weight of flour, and weight of damaged corn as well as the standard deviation value.

When the QPM grains were infested with LGB in the laboratory, the results varied in terms of damage by LGB and the amount of flour produced. A few of the varieties showed that resistance to LGB, with approximately 70 entries having less than 2.1 grams of flour.

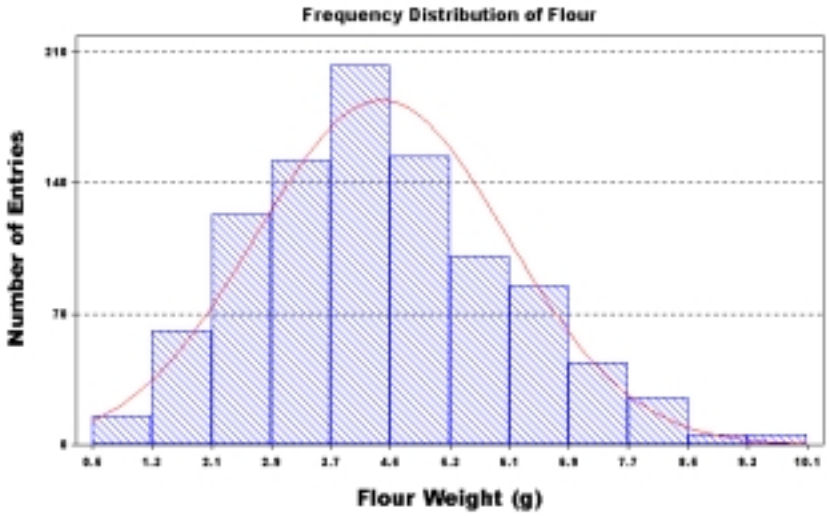

Fig. 3 Frequency distribution of flour production (grams) due to Larger Grain Borer damage on 973 entries of QPM.

The frequency distribution of adults shows that many of the QPM varieties are fairly resistant (about 100 entries with less than 27 weevils) to LGB. Very few varieties were highly susceptible to LSB.

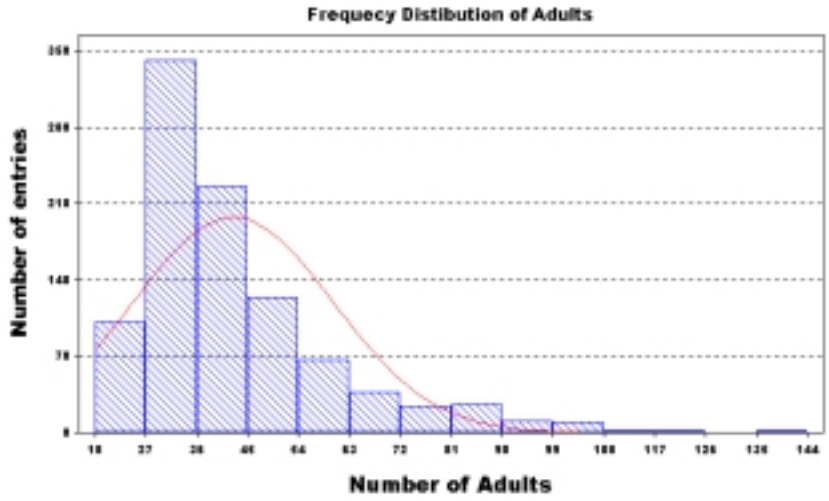

Fig.4 Frequency Distribution of Larger Grain Borer Adults on 973 QPM entries.

The Percent Loss was calculated for each QPM line. The results showed approximately 155 varieties with less than 14% loss due to LGB.

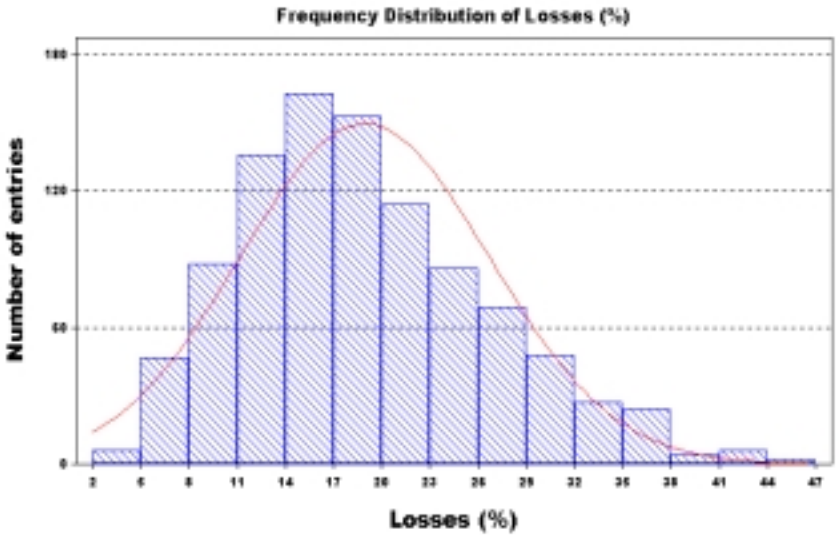

Fig. 5 Frequency Distribution of Percent Losses due to LGB damage to 973 QPM entries.

Histograms created showed frequency distributions of percent losses, flour weight, and number of adult LGB. This showed that there were genetic differences between QPM varieties and their resistance to the LGB. Correlations were calculated for adults to flour, percent losses to adults, and percent losses to flour. Correlations were high between the weight of flour and percent losses (.9889 P-Value of 0.00). Correlations were also good between adults and percent loss (.7762 P-Value 0.00); as well as adults and flour (0.7394 P-Value 0.00). These results indicate that resistance in QPM against LGB can be expressed in terms of any of the three parameters measured, i.e., grain damage, powder production, and number of LGB recovered, because the parameters were highly correlated with one another.

Correlations

	Adults	**Flour**
Flour	0.7394	*****
	P-value 0.00	*****
% Losses	0.7762	0.9889
	P-value 0.00	P-value 0.00

CASES INCLUDED 973 MISSING CASES 0

Fig. 6 Pearson correlations calculated between adults and flour, percent losses and adults, and flour and percent losses.

The data that the QPM varieties derived indicate that there is genetic difference in QPM varieties to the resistance of the LGB. Low flour production and insect

multiplication would indicate low percent loss of maize. When the specific varieties are found with low percentage of losses, these varieties could be used in the future to develop QPM hybrids and populations that are resistant to the LGB.

Conclusions

This set of data indicates genetic difference in the susceptibility to the Larger Grain Borer in Quality Protein Maize varieties. Frequency distributions showed variance in the damage, flour production, and number of adults in QPM varieties. High correlations found between flour production, percent maize loss, and number of LGB adults, indicated this data is relevant in finding a variety resistant to LGB. When the varieties that have low susceptibility are identified, a variety that is both nutritious and resistant to the LGB may be developed.

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