Veery 'S': Bread Wheats for Many Environments

Cimmyt
1966-1986

maize and wheat for the third world

Veery 'S': Bread Wheats for Many Environments

Introduction

During the past two decades, the agricultural sectors of many developing countries have undergone a profound transformation, with traditional modes of production rapidly giving way to modern, productivity-enhancing agricultural technologies. Although this transformation is by no means complete, science-based agriculture has improved the well-being of literally millions upon millions of farmers and consumers in developing countries. Playing no small role in this transformation were the short-strawed, high-yielding bread wheats developed by CIMMYT, in concert with national crop improvement programs around the world. The widespread adoption of these components of modern agricultural technology resulted in spectacular increases in wheat production in a number of developing countries.

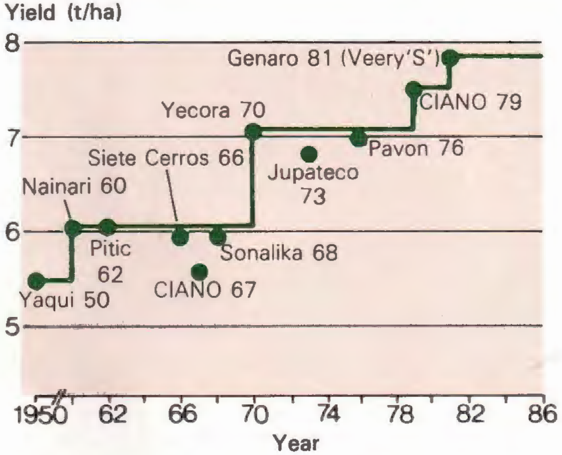
Veery lines combine higher yield potential with greater yield stability across a wide range of environments.

This publication focuses on one of many impressive achievements in wheat breeding: the development of the cross Veery. More precisely, it explores the question *why* the Veery lines constitute an outstanding achievement. There are basically two reasons: Eight years of international testing in hundreds of environmentally diverse locations have shown 1) that the Veerys have moved high-yielding bread wheats onto a new yield level, some 10% higher than the previous level, and 2) that the yields of Veery sister selections are extremely stable across a wide range of production environments. These traits are described in greater detail in the following pages; understanding their significance, however, requires first a bit of history, as well as a sense of the CIMMYT Wheat Program's basic operational methodologies.

A Brief Look Back

The rapid movement away from traditional agriculture in the Third World earned the name "Green Revolution." For years this revolution was deemed a nearly unqualified success. Early adoptors of the new technologies, quite logically, tended to be the relatively well-off farmers who could afford the additional inputs needed to take advantage of the higher yield potential of the modern varieties, as well as the risk associated with changing from traditional to modern agricultural systems. Many of those who fostered this early change anticipated that the new, more productive technologies would quickly "trickle down" to poorer farmers who could ill afford to risk their livelihoods on unproven technologies.

Toward the end of the 1970s, critics of the Green Revolution began claiming that resource-poor farmers were being bypassed in the transformation to modern agricultural systems. Many reasons for this situation were put forth, among them the idea that the new varieties were themselves inherently faulty. The critics made largely unsubstantiated claims that high levels of



Pushing back the yield barrier: Average yield of Mexican varieties under favorable management and in the absence of disease (yield potential trials at CIANO Experiment Station, 1982-1984).

additional inputs were essential to achieve the much-touted production increases and that the "miracle" seeds yielded less than traditional varieties when the added inputs were lacking. There was also a question of yield stability in the more productive environments; after all, the risk of losing 20% of a 5 t/ha crop due to some unforeseen event tends to be more difficult for farmers to accept than a 20% loss when the expected yield is only 1 t/ha.

A major objective of the CIMMYT Wheat Program's research is to develop "input-efficient" and "input-responsive" wheat germplasm.

The yield stability question clearly is a valid concern, both for farmers and for researchers. For farmers, it is a matter of being able to count on the new varieties even when production conditions are poor. Objective analyses undertaken since the late 1970s have shown rather conclusively that many high-yielding varieties (HYVs) of wheat generally perform as well or slightly better than traditional varieties in low-input environments; and, not surprisingly, they perform significantly better than traditional varieties as production conditions improve.

For researchers, the stability question is more a matter of enhancing the already stable performance of HYVs, and combining this trait with even higher yield potential. Stated somewhat differently, a major objective of research is to develop germplasm that uses available nutrients and moisture efficiently when inputs are low ("input-efficient" materials); when inputs are more plentiful, this same germplasm can respond exceptionally well to the better conditions (it is "input-responsive").

By the early 1980s, CIMMYT had developed an impressive array of input-efficient, input-responsive advanced lines of bread wheat for use by national research programs in their varietal development efforts. A number of approaches have been used by the Center's wheat breeders to create this array. Of these approaches, one of the more productive has been the crossing of two diverse germplasm pools, spring- and winter-habit wheats. A high proportion of the better advanced lines in CIMMYT's wheat germplasm base, including the Veerys, stem from the spring x winter crossing program. Before exploring in detail the winning characteristics of Veery, however, we should first consider the Wheat Program's general approach to wheat breeding, and spring x winter crosses in particular. This will provide added insight into how the traits that make Veery exceptional were combined.

Crosses of spring- and winter-habit wheats are made using procedures developed by breeders to synchronize the flowering of both types.

Wheats for Many Environments

In the developing world, wheat is grown under a range of very diverse production conditions. Dealing with this diversity remains one of the central challenges confronting CIMMYT wheat breeders. Over the years a successful strategy emphasizing broad adaptation within large, relatively homogeneous environments (termed "mega-environments") has evolved. The six mega-environments used by CIMMYT in targeting the development of bread wheat are the following:

- Irrigated areas;
- Rainfed environments in which moisture is sufficient (more than 500 mm/cycle);
- Rainfed environments in which drought stress often occurs (rainfall is less than 500 mm/cycle);
- Highland zones in which severe disease epidemics occur;
- Acid-soil areas in which wheat production is limited by toxic levels of aluminum;
- Warmer regions in which sudden temperature increases toward the end of the crop cycle are common.

To develop germplasm for these mega-environments, the Center's Wheat Program employs a breeding strategy having four interrelated features: large numbers of crosses; shuttle breeding; heavy disease pressure; and international, multilocation testing.

The numbers game—During each breeding cycle, thousands of simple and top crosses are made using a broad range of parental material collected from many parts of the world. The selection of this parental material depends on a number of factors, especially the performance data received from our cooperators in the international testing network. We should note here that the selection of parental material is not based on genetic analyses for disease resistance or yield components. Rather, the mere presence of desirable traits provides sufficient reason for their inclusion in the crossing program, and crosses are often made without full knowledge of inheritance patterns. This expedites considerably the germplasm development process. Similarly, no combining ability studies, *per se*, are made for the crossing program. While these exercises are necessary for scientific publication and a more complete understanding of genetic interactions, the Wheat Program has found it more practical to substitute for such analyses many years of close observation in the field. These studies, after all, are not central to the Program's primary mission: the development and delivery to cooperating national programs of improved wheat and triticale germplasm.

Dealing with environmental diversity remains one of the central challenges confronting CIMMYT wheat breeders.

Shuttle breeding—Germplasm is screened and selected during two cycles each year at two primary locations in Mexico: the government's Northwestern Agricultural Research Center (CIANO), near Ciudad Obregon in the State of Sonora (27.2°N, 39 m above sea level), and the Toluca experiment station in the State of Mexico (18.5°N, 2649 m above sea level) (see map, page 8). Plantings are made at CIANO in November and selection and harvest are completed in April. Seed is then shuttled 1850 kilometers south to Toluca, where plantings are made in May and June. Selection and harvest finish in October, and seed is then shipped back to CIANO for planting in November.

These two locations differ markedly in elevation, soil type, rainfall patterns, heat units (temperature regimes), diseases and photoperiodism. Only those breeding materials that withstand the rigors of these two very different environments are advanced in the CIMMYT system; the rest are simply discarded. Hence, the shuttle breeding process in Mexico is the first step toward developing broadly adapted varieties.

Disease pressure—Environmental conditions at CIANO and Toluca are such that, with artificial inoculation to ensure uniformity of infection, heavy disease pressure can be placed on breeding materials permitting resistant lines to be identified. During the winter cycle at CIANO, rains are rare but heavy dew occurs frequently, which is conducive to the development of leaf rust (*Puccinia recondita*) and stem rust (*P. graminis tritici*). At the highland Toluca site, frequent rains and cool temperatures prevail throughout the summer cycle, providing ideal conditions for establishing epidemics of such foliar diseases as stripe rust (*P. striiformis*), and those caused by *Septoria tritici, Fusarium graminearum, F. nivale*, and barley yellow dwarf virus. Occasionally, epidemics of *Helminthosporium tritici-repentis, S. nodorum*, and bacterial leaf blight can also be obtained.

Primary experiment stations in Mexico on which CIMMYT conducts wheat research.

International testing—Advanced lines that have passed the rigors of selection in Mexico undergo international testing in more than 150 locations worldwide each year; a number of commercial varieties are also included in the international nurseries. CIMMYT acts as the hub of a large network of cooperating researchers, a system that enables the efficient evaluation of hundreds of lines and varieties each year under extremely diverse conditions. By virtue of this network, varieties and experimental materials are simultaneously subjected to many biotypes of the important diseases of wheat, and are also tested under a range of stress conditions.

International, multilocation testing allows hundreds of advanced lines and varieties to be evaluated each year under extremely diverse environmental conditions.

The Center compiles the nurseries and distributes them upon request among network participants; performance data for many of the nurseries are then returned to CIMMYT for analysis and publication (a number of F_2 nurseries are distributed, but data are not returned). The majority of the materials that cycle through this testing system emanate from the CIMMYT breeding programs, but advanced lines and varieties from many cooperating national wheat programs are also included. Cooperators who grow and evaluate these international nurseries are free to use the germplasm in any way deemed appropriate. The network thus provides not only valuable feedback on the performance of materials under diverse conditions, but a mechanism for sharing experimental materials as well.

Spring x Winter Crosses

The spring x winter wheat crossing program has been one of the more productive approaches used to develop improved wheat germplasm. First, a quick look at the materials themselves.

Bread wheat germplasm has one of three basic growth habits: spring, winter, and intermediate (facultative). Spring wheats have a continuous growth cycle that brings them to harvest in 4-5 months. These wheats generally cannot survive an extended period of freezing temperatures. Winter wheats, in contrast, must have their growth cycle interrupted by a continuous period of low temperatures (this requirement is termed ''vernalization''). Planted in autumn, winter wheat is ready for harvest the following summer, some 10-11 months later. Without vernalization, these wheats remain in a vegetative state; tillers will not elongate, nor are heads, flowers, and seeds produced. Intermediate types have, as the name implies, some of the attributes of both spring and winter types, and evolved to fit fairly specific environmental niches.

The spring- and winter-habit pools are by far the predominant types. Each has its strengths and weaknesses relative to the other. Spring wheats, for example, tend to have higher yield potential per unit of time, broader adaptation, better resistance to leaf and stem rusts, stronger straw, and better milling and baking quality; winter wheats have better resistance to foliar diseases (other than leaf rust), greater tolerance to cold and heat (especially high temperatures late in the crop cycle), and better apparent tolerance to drought.

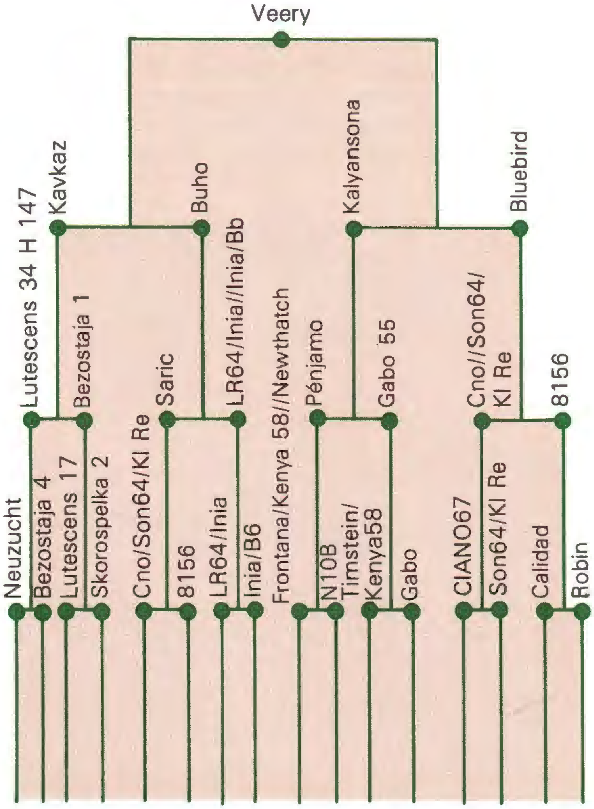
The idea of making crosses between these two gene pools is not new, having been done in a limited manner for many years to introgress specific genes from one germplasm pool into the other. In 1972 CIMMYT (in collaboration with Oregon State University, USA) began exploring these vast gene pools much more extensively for the improvement of both pools. Crosses between springs and winters were made in Mexico;

collaborators at Oregon State went on to improve the winter-habit progeny, while CIMMYT breeders developed the spring types. Veery 'S', a spring wheat, is a product of this crossing program.

Breeding methods in brief—When planted at the same time in the same location, spring and winter wheats fail to flower together, normally rendering infeasible any crosses between the germplasm pools. Two procedures are used by CIMMYT breeders to effect such crosses. First, winter wheats are sown at the Toluca station in November; the cold temperatures of December, January and February achieve the vernalization necessary for winter types to head and reproduce. By staggering the planting dates of spring wheats at Toluca (beginning in January), it is possible to synchronize flowering for both types in May, thus allowing breeders to make their crosses.

Under the leadership of Dr. S. Rajaram, the CIMMYT bread wheat breeding program began extensive work with spring x winter crosses in 1972.

A second procedure is used at CIANO. Seedlings are grown in pots and vernalized for 45 days in cold chambers (3-4°C) under 12 hours of artificial light daily. After further preconditioning at 8°C for a week, the seedlings are transplanted to an outdoor nursery, where electric lamps add up to 6 hours of extra light per day. Using this procedure, the winter wheats flower concurrently with the spring lines normally grown at CIANO, thus permitting crossing. Together, these two procedures enable more than 1,000 new spring x winter crosses to be made each year.



Parentage of Veery 'S' (back to tertiary parents only)

The Development of Veery 'S'

Veery 'S' is the most noteworthy of the crosses coming out of the spring x winter crossing program. The process by which the Veery lines were developed clearly reflects the Wheat Program's approach to breeding research.

In the spring of 1973, CIMMYT breeders crossed the Mexican spring wheat Buho 'S' to Kavkaz, a winter wheat from the USSR. F_1 plants were top-crossed to a promising spring wheat that combined the parentage of Kalyansona (an Indian variety based on CIMMYT's advanced line 8156) and Bluebird (a Mexican variety). Certain F_2 progeny showed considerable promise and were advanced for further observation and selection.

Unknown at that time, these progeny carried the 1B/1R translocation (the short arm of the 1B chromosome in bread wheat was replaced by the short arm of the 1R chromosome of rye), a change in genetic composition that was to confer a range of improved performance characteristics. In 1977-78 the cross was given the breeding name "Veery" and various lines were added to the International Spring Wheat Yield Nursery (ISWYN), which is distributed to some 150 locations worldwide for evaluation.

In 1981, eight years after the initial cross was made between the two germplasm pools, the first three Veery-based varieties were released by Mexico as Glennson 81, Genaro 81, and Ures 81; Pakistan also released a Veery selection in 1981, under the name Pak 81. The releases in Mexico were followed in 1982 by the release of Seri 82. Since then, a number of countries have released Veery-based cultivars (Table 1, page 14), and there is strong evidence of their rapid adoption by farmers. During the five years since the first Veerys were released, over three million hectares have come under cultivation worldwide. In Mexico alone, for example, nearly 800,000 hectares (over 80% of Mexico's total wheat area) are now devoted to varieties stemming from Veery germplasm, and in Pakistan the variety Pak 81 now covers an estimated one million hectares.

Most Veery-based varieties are recent releases (1984-85), and their area worldwide will increase dramatically as seed becomes more readily available to farmers.

Table 1. Countries in which Veery sister selections have been released, or in which seed is being multiplied in anticipation of varietal release (presented in the order of their release).

Released Varieties (Names)	Country of Release (or multiplication)	Year of Release
Glennson 81	Mexico	1981
Genaro 81	Mexico	1981
Ures 81	Mexico	1981
Pak 81	Pakistan	1981
Seri 82	Mexico	1982
La Molina 82	Peru	1982
Rusape	Zimbabwe	1982
Millaleu Inia	Chile	1983
Loerie	Zambia	1983
Gamtoos	South Africa	1983
Dashen	Ethiopia	1984
Cordillera 3	Paraguay	1984
Lima 1	Portugal	1984
Arganda	Spain	1984
Cartaya	Spain	1984
L.E. Cardenal	Uruguay	1984
Numidie	Algeria	1985
Nobo Inia	Chile	1985
HUW 206	India	1985
R253	Kenya	1985
Viri	Tanzania	1985
Seric	Zambia	1985
Pirsabak 85	Pakistan	1985
Gicinya (being multiplied)	Rwanda	1986*
No name as yet (being multiplied)	Bolivia	1986*
No name as yet (being multiplied)	Burma	1986*
No name as yet (being multiplied)	Turkey	1986*

* Probable year of release

Underlying the rapid release and adoption of Veery-based varieties are the two general performance characteristics mentioned at the beginning of this publication: the Veery lines' higher yield potential combined with their greater yield stability. First a look at yield potential, then we will have a somewhat longer discussion of yield stability.

The rapid release by developing countries of Veery-based varieties is accompanied by remarkably rapid adoption by farmers.

Yield Potential—Veery 'S' has convincingly broken through the apparent "yield barrier" that some have postulated for high-yielding bread wheats. The results of eight years of yield testing in various locations in Mexico, and in hundreds of locations internationally, have shown the Veery varieties and advanced lines to have an average genetic yield potential that is on the order of 10% higher than other widely adapted HYVs. Table 2 (page 16) provides a comparison between the yield of four Veery-based varieties and the HYVs Pavon 76, Anza, and Siete Cerros in ISWYNs 15-20.

The international testing of Veery 'S' lines began in 1978, and since then a Veery line has been the top-performing entry averaged across all testing locations to which the ISWYN has been distributed; preliminary results from 1984-85 indicate a similarly outstanding performance. For example, in the 19th ISWYN (1982-83) the yield superiority of Seri 82 over Pavon 76 and Anza, as well as over the best local check varieties, is striking. Results of the 19th ISWYN were returned from 55 sites: Anza yielded more than the Veery-based variety in only 6 locations, while Pavon 76 produced higher yields at only 13 sites. Seri 82 even yielded more than the best local check varieties in 76% of the locations. Such performance clearly reflects a high level of yield stability across environments.

Table 2. Average yields of Glennson 81, Genaro 81, Ures 81, and Seri 82, expressed as a percentage of Pavon 76, Anza, and Siete Cerros, for the 15th through 20th International Spring Wheat Yield Nurseries (ISWYNs).

Variety and ISWYN Number	As a Percentage of Pavon 76	Anza	Siete Cerros
Glennson 81			
ISWYN 15	***	***	***
ISWYN 16	***	***	***
ISWYN 17	102	107	125
ISWYN 18	100	106	110
ISWYN 19	103	109	125
ISWYN 20	104	113	122
Genaro 81			
ISWYN 15	***	***	***
ISWYN 16	***	***	***
ISWYN 17	105	110	128
ISWYN 18	102	109	113
ISWYN 19	102	108	124
ISWYN 20	103	112	121
Ures 81			
ISWYN 15	***	***	***
ISWYN 16	106	115	118
ISWYN 17	100	105	123
ISWYN 18	103	110	114
ISWYN 19	106	111	128
ISWYN 20	105	114	123
Seri 82			
ISWYN 15	108	111	119
ISWYN 16	***	***	***
ISWYN 17	***	***	***
ISWYN 18	108	115	119
ISWYN 19	109	115	132
ISWYN 20	107	117	126

*** Not included in the nursery that year

Yield Stability—As indicated earlier, those who view with alarm the spread of modern agricultural technologies in developing countries are concerned, in part, with what they see as a lack of yield stability in the HYVs. Yield stability, of course, means different things to different people, but in the final analysis, it should imply less variation in yield over time across the range of production circumstances faced by farmers. In 1980 CIMMYT wheat breeders, long concerned with the stability question, provided the first 15 years of ISWYN data to independent researchers for an in-depth statistical analysis of yield stability. What follows is a brief discussion of their findings.

Yield stability means different things to different people, but in the final analysis, it should imply less variation in yield over time across the range of production circumstances faced by farmers.

There are four basic ways in which a variety may respond as production conditions improve, as shown in Figure 1 (page 18). Average yields of progressively better sites are shown on the X-axis, and the variety yields are shown on the Y-axis. The yield of a given hypothetical variety at each site is plotted and a regression line is drawn through the points that represent the performance of each genotype in the different environments. The slope of this regression line measures the responsiveness of the variety to better growing conditions. The regression line that represents the average response of all entries grown in each environment would have a slope of 1.00 (a 45° line). Thus, if the slope of the variety regression line is greater than 1.00 (as it is for Varieties 1 and 2 in Figure 1), responsiveness to improving conditions is above average. The greater the slope, the higher the responsiveness of the variety. CIMMYT seeks Variety 1 types; Variety 2 types are rejected because they yield less than the average in poorer production environments, and Variety 3 and 4 types do not respond well to improving conditions.

The key point here is that the regression line of Variety 1 types lies entirely above the 45° line, i.e., Variety 1 performs at least as well as the average under low input conditions *and* it responds better than the average as production conditions improve. It should come as no surprise that Veery-based varieties are of this type.

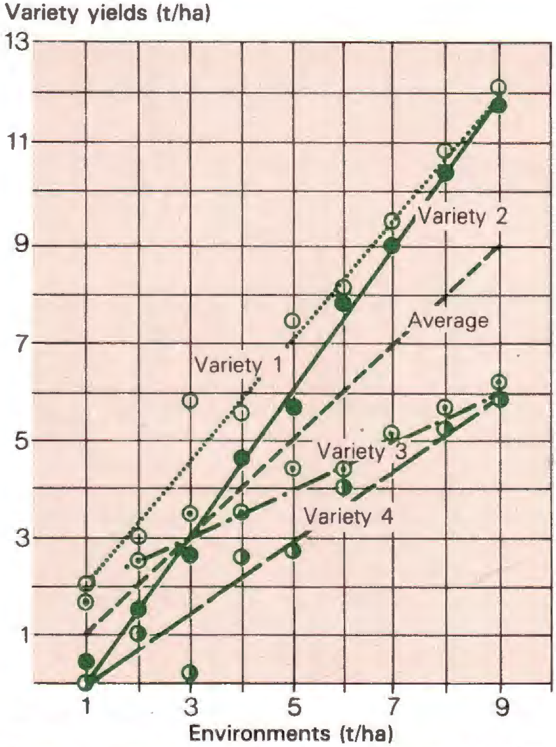


Figure 1. Response of four hypothetical varieties to higher productivity levels

A real-world example to drive the point home: An analysis of the 15th ISWYN shows that the yield of Veery 'S' is consistently better than the average yield of all entries in nearly all environments (Figure 2). The fact that the Veery regression line in Figure 2 is above the average yield regression line indicates that Veery 'S' performs better than the average both in poor and in favorable environments. In other words, the Veery lines use available inputs efficiently in low-input environments, and are able to respond favorably as production conditions improve. These conclusions are further supported by the results of ISWYNs 16-20. For example, in Table 3 (page 20) notice the exceptional performance of Seri 82 across 12 environmentally diverse regions.

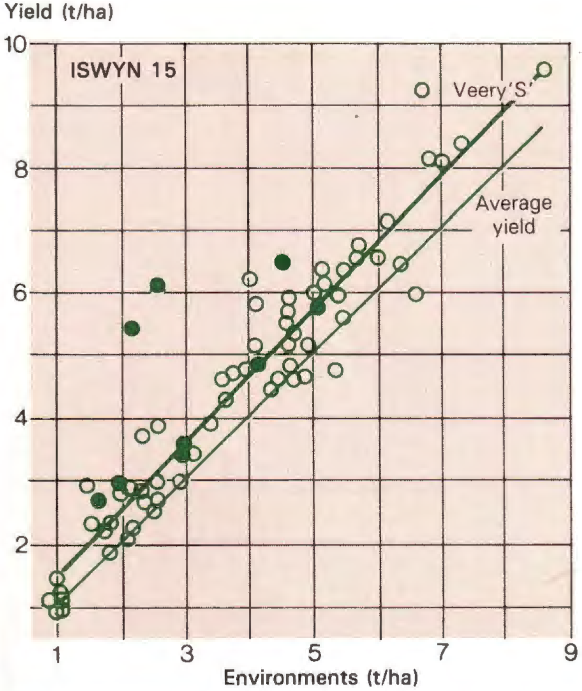


Figure 2. Yield of Veery'S' in the 73 environments of the 15th ISWYN (Pfeiffer, 1984)

The impressive stability of the Veery materials stems from their enhanced disease resistance, tolerance to certain environmental stresses, and improved plant type.

Disease resistance—The winter wheat parentage in the Veery lines conferred improved resistance to two diseases of wheat, stripe rust and powdery mildew, as well as added resistance to septoria diseases and leaf rust. The enhanced resistance of Veery 'S' is evident in Figure 2 (page 19). The 15th ISWYN was grown in several tropical highland environments that, except for a high incidence

Table 3. Yield of Seri 82 across 12 environmentally diverse regions (absolute yield and as a percentage of Pavon 76, Anza, and Siete Cerros), 19th ISWYN, 1982-83.

	Absolute Yield	As a Percentage of Pavon 76	Anza	Siete Cerros
Global	4487	109	115	132
Region 1	8638	125	102	165
Region 2	5737	109	120	126
Region 3	2663	114	141	215
Region 4	5209	103	108	110
Region 5	5274	114	118	140
Region 6	4762	115	110	115
Region 7	3558	101	116	133
Region 8	1892	108	220	225
Region 9	6151	115	132	130
Region 10	4425	107	115	118
Region 11	4144	98	101	137
Region 12	1465	103	92	104

Region 1: Mediterranean, North Africa and Iberia
2: North East Africa and Middle East
3: East African Highlands
4: Southern Cone of Africa
5: Asia Subcontinent
6: European Region
7: Southern Cone of South America
8: Andean Region of South America
9: Highlands of Central America (including Mexico)
10: Northern Mexico and Southern USA
11: Northern USA and Canada
12: Tropical Zone

of disease, were relatively fertile, i.e., they were classified as 2-3 t/ha environments not because fertility was low or moisture was insufficient, but because heavy disease pressure depressed the yields of most of the materials grown so that the average site yield was low. The Veerys tended to do well in these environments (indicated by the solid points in Figure 2) because of the lines' improved disease resistance.

Some of the Veery lines also appear to have "dilatory" (partial) resistance to leaf rust infection in Mexico, i.e., they express a susceptible response to the pathogen, but infection is delayed until later in the crop cycle (Figure 3). The final level of infection at harvest may be as high as for other varieties, but because disease development is delayed yield reductions are limited.

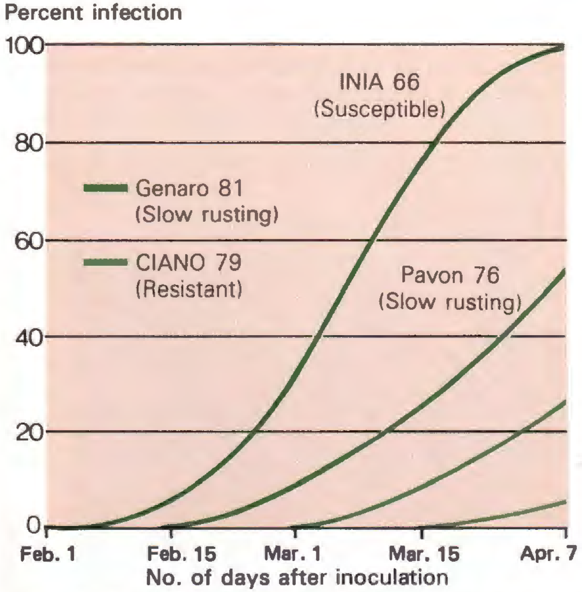


Figure 3. Slow rusting resistance to leaf rust (Cd. Obregon, 1984-85)

Stress tolerance—The Veerys appear to possess superior drought tolerance, in that they tend to perform well in locations where moisture is a limiting factor (such as in Regions 1 and 2 in Table 3, page 20). This enhanced tolerance to drought probably comes from the winter wheat parentage.

Veery lines also possess better tolerance for cold temperatures early in the crop cycle and for excessive heat at the late growth stages (they finish well), again traits conferred by the winter parent. In addition, Veerys are more efficient in their ability to extract phosphorus, which enables them to perform better than most other HYVs in acid soils.

Improved plant type—The Veerys have a compact plant type that bestows several benefits: the harvest index is high, with many large, upright heads per square meter; the plant architecture is such that the plant density can be increased; and the plants "stay green" for a longer period, i.e., they retain green leaves closer to physiological maturity, an indication of their robust health.

Conclusion

Veery 'S' is clearly an outstanding achievement in wheat breeding. The cross and its subsequent development has moved high-yielding bread wheats onto a new yield level, and has combined this higher yield potential with yield stability across a wide range of environments that exceeds the already stable performance of previous HYVs.

In an overwhelming number of cases, Veery lines are being selected and used by national wheat improvement programs in developing countries. The superior characteristics of Veery lines and their adaptation to a wide range of environments are resulting in the rapid release of Veery-based varieties; their adoption by farmers is occurring at an accelerating pace, as well.

The Veerys are the result of years of careful and innovative research designed to combine the best traits from the spring- and winter-habit germplasm pools. The success of the effort must be attributed to the spirit of cooperation that characterizes international wheat improvement research. CIMMYT breeders have played a primary role, but the collaboration of national wheat programs in the Third World has been central to the progress achieved.

The ultimate beneficiaries of this research, of course, are wheat growers and the consumers of wheat products who reside in developing countries. The exceptional characteristics of Veery-based varieties enhance their performance across the range of diverse environmental conditions confronting millions of Third World farmers. Veery 'S', because of its high yield potential and impressive yield stability, is truly a bread wheat for many environments.

The compact plant type of Veery materials confers the benefits of a high harvest index and the possibility of increasing plant density.

Author: CIMMYT Wheat Staff

Design and layout: Miguel Mellado E., Rafael de la Colina F., José Manuel Fouilloux B., Bertha Regalado M.

Typesetting: Silvia Bistrain R., Maricela A. de Ramos.

The International Maize and Wheat Improvement Center (CIMMYT) is an internationally funded, nonprofit scientific research and training organization. Headquartered in Mexico, CIMMYT is engaged in a worldwide research program for maize, wheat, and triticale, with emphasis on food production in developing countries. CIMMYT is one of 13 nonprofit international agricultural research and training centers supported by the Consultative Group for International Agricultural Research (CGIAR). The CGIAR is sponsored by the Food and Agriculture Organization (FAO) of the United Nations, the International Bank for Reconstruction and Development (World Bank), and the United Nations Development Programme (UNDP). The CGIAR consists of 40 donor countries, international and regional organizations, and private foundations.

CIMMYT receives support through the CGIAR from a number of sources, including the international aid agencies of Australia, Austria, Brazil, Canada, China, Denmark, Federal Republic of Germany, France, India, Ireland, Italy, Japan, Mexico, the Netherlands, Norway, the Philippines, Saudi Arabia, Spain, Switzerland, United Kingdom and the USA, and from the European Economic Commission, Ford Foundation, Inter-American Development Bank, International Bank for Reconstruction and Development, International Development Research Centre, OPEC Fund for International Development, Rockefeller Foundation, and the United Nations Development Programme. Responsibility for this publication rests solely with CIMMYT.

Correct Citation: CIMMYT Wheat Staff. 1986. *Veery'S': Bread Wheats for Many Environments*. CIMMYT, Mexico, D.F., Mexico.

Centro Internacional de Mejoramiento de Maíz y Trigo,
International Maize and Wheat Improvement Center
Lisboa 27, Apdo. Postal 6-641, 06600 México, D.F., México