



**UNIVERSITI PUTRA MALAYSIA**

**ADAPTABILITY OF WHEAT IN MALAYSIA**

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# **ADAPTABILITY OF WHEAT IN MALAYSIA**

**By**

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*This Thesis Is Specially Dedicated To My Dearest Mother Mrs. Golanur  
Begum And To My Beloved Wife Depu.*

.....  
*JADER JONNO AHTO-TUKU POTH ASA*  
.....

*Their Sacrifice And Infinite Love Led Me To Present Achievements*



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## LIST OF ABBREVIATION

BARI	=	Bangladesh Agricultural Research Institute Location : Joydebpur, Gazipur, Bangladesh.
CIMMYT	=	Centro Introcoional de Meheremieonto de Maize Y Trigo ( Spanish ) International Maize and Wheat Improvement Centre (English) Location : Mexico.
UPM	=	Universiti Putra Malaysia (Formerly University of Agriculture Malaysia) Location : Serdang, Selangor, Malaysia.
WRC	=	Wheat Research Centre Location : Nashipur, Dinajpur, Bangladesh.
DH	=	Days to heading
DM	=	Days to maturity
DGF	=	Days to grain filling
FT	=	Fertile tiller
NFT	=	Non fertile tiller
TT	=	Total tiller
SS	=	Spikelet per spike
GS	=	Grain per spike
PHT	=	Plant height
1000 Gwt	=	1000 Grain weight
YD	=	Yield
Entry - 13 ( CHOAH )	=	FCH 3/SNI/NKT CM 82533-08TORM-15Y-025H-0SY-2M-2Y
Entry - 28 ( AHCHOL )	=	CHIL/PRL CM 92354-62Y-0H-0SY-1M-0RES



## LIST OF TERMINOLOGY

### **Bread Wheat or Common Wheat :**

Most modern varieties belong to hexaploid wheat *Triticum aestivum* var. *aestivum*. Because of the high gluten content of the endosperm this common wheat, and specially its harder grained are highly valued for bread making. The sticky gluten protein entraps the carbon dioxide formed during yeast formation and enables a leavened dough to rise.

### **Durum :**

Durum wheat, *Triticum turgidum* var. *durum* is the most modern tetraploid type. It is mainly grown in relatively drier regions. Its large, very hard grains suitable for macaroni and semolina products.

### **Triticale:**

Triticale is a small-grain cereal which represents the first successful attempt to synthesize a new crop species from intergeneric hybridization. As a common name indicates, triticale is the result of the combination of two genera, wheat (*Triticum*) and rye (*Secale*). Both hexaploid ( $2n = 6x = 42$ ) and octaploid ( $2n = 8x = 56$ ) forms of triticale are being developed. Morphologically, triticale resembles wheat both in plant-type and kernel characteristics. The main differences lies in its greater vigor relative of wheat and its larger spike and kernel size.

### **Red Hard Wheat, Red Soft Wheat, White Hard Wheat and White Soft White :**

Wheat is also classified by its grain color and softness and hardness.



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## **ADAPTABILITY OF WHEAT IN MALAYSIA**

By

**GOLAM FARUQ**

**January 1999**

**Chairman : Mihdzar Abdul Kadir, Ph. D.**

**Faculty : Agriculture**

Wheat is a cool season crop, but it flourishes in many different agro-climatic zones and has the broadest adaptability compared to all other crops in the world. Recent advances in technologies for wheat production in humid tropical environments have promoted Malaysia to initiate research to develop technologies for domestic wheat production. This program places special emphasis on the identification of superior germplasm for further research in tropical Malaysia.

A discouraging situation was observed during the 1st experiment (Benchmark study). Two hundred eighty eight germplasm accessions were used in this study and the results revealed that all germplasm accessions were affected with seedling blight, severe *Helminthosporium* leaf blotch and partially *Fusarium* head scab. All germplasms germinate well, but gradually more than 50 % died within six weeks. Less tiller, short spike length, shriveled grain and high sterility were common constraints for good yield.



A total of 288 germplasms were evaluated in first experiment and based on different characters 175 germplasms were selected and 34 of them produced grain. The scene was dramatically changed in the second experiment (2A), where 175 germplasm accessions were grown in 30 cm x 30 cm size polybag with four replications and a prescribed soil mixture of top soil, sand and peat soil with a ratio of 3:2:1 was used. Vegetative growth of all genotypes was normal with optimum number of tillers up to 11 and spike length up to 9 cm. A total of 40 genotypes produced grain in this study. Visual grain quality also improved compared with benchmark study. In the subsequent 3rd experiment (2B), again 175 germplasm accessions were used with same management practices to study further development of genotypes in different growing season time and comparison with the previous growing seasons. The same 40 genotypes only produced grain but the sterility level had changed in some genotypes. Results from 1st and 2nd growing seasons revealed that the agronomic characters were significantly influenced by different genotypes and a positive correlation confirmed that some quantitative characters like fertile tillers, grain per spike and 1000 grain weight are important characters having direct bearing on influencing plant yield. Forty germplasms which produced grain were selected and used in the final experiment. *Helminthosporium* leaf blotch infestation was observed with a Disease index (DI) range of 1 - 9. Seven genotypes were found with minimum infestation (DI -1). Six genotypes produced almost normal shiny grain but lower 1000 grain weight compared with original grain. However, based on yield contributing characters and grain quality, entries 13, 28, 31, 45, 58, 72, and 73 were identified as outstanding among the 175 genotypes. These lines seems to be more potential for further research in Malaysia and by introducing wheat as a new crop in Malaysia, it may eliminate an important part of the foreign exchange drain.



Abstrak tesis untuk senat Universiti Putra Malaysia bagi memenuhi Keperluan  
Penganugerahan Ijazah Master Sains Pertanian

**PENYESUAIAN TANAMAN GANDUM DI MALAYSIA**

Oleh

**GOLAM FARUQ**

**Januari 1999**

**Pengerusi : Dr. Mihdzar Abdul Kadir**

**Fakulti : Pertanian**

Gandum adalah tanaman musim sejuk, tetapi ianya boleh hidup dengan subur pada berbagai zon persekitaran pertanian. Tanaman gandum mempunyai daya penyesuaian yang tinggi jika dibandingkan dengan tanaman-tanaman lain di dunia. Peningkatan teknologi untuk pengeluaran gandum pada masa kini di persekitaran tropika yang lembap telah mendorong Malaysia untuk memulakan penyelidikan teknologi bagi pengeluaran gandum tempatan. Program ini memberi tumpuan khusus ke atas pengenalpastian dan penghasilan germplasma yang lebih baik untuk penyelidikan selanjutnya di persekitaran tropika Malaysia.

Keadaan yang kurang memuaskan telah diperhatikan semasa kajian awal. Sebanyak 288 barisan germplasma telah digunakan dalam kajian ini dan hasilnya menunjukkan bahawa barisan germplasma telah dijangkiti penyakit seperti hawar



anak benih, jangkitan *Helminthosporium* yang teruk, dan sedikit penyakit 'scab' yang di sebabkan oleh kulat *Fusarium*. Kesemua barisan germplasma telah bercambah dengan baik, bagaimanapun secara beransur-ansur 50% dari jumlah anak pokok telah mati dalam masa enam minggu. Terdapat penghasilan 'tiller' jambak bunga (spike) yang pendek, biji yang kecut dan kadar steriliti yang tinggi adalah sebagai faktor-faktor penghalang kepada hasil yang baik. Sejumlah 175 germplasma berdasarkan ciri-ciri yang berbeza telah dipilih untuk ujian selanjutnya dan 34 darinya menghasilkan biji gandum.

Senario telah berubah dalam ujian kedua, di mana 175 barisan germplasma telah ditanam di dalam polibeg ber saiz 30 cm X 30 cm dengan 4 replikasi menggunakan tanah campuran 3 : 2 : 1 (tanah atas : pasir : gambut). Tumbesaran tampang untuk semua jenis genotip kelihatan normal dengan jumlah 'tillers' yang optimum sehingga bilangan 11 dan panjang 'spike' sehingga 9 cm. Sejumlah 40 genotip menghasilkan biji gandum semasa kajian ini. Kualiti biji juga di dapati bertambah baik jika dibandingkan dengan kajian awal.

Dalam kajian ketiga, 175 barisan germplasma juga telah digunakan dengan cara pengurusan yang sama seperti kajian-kajian lepas. Tujuan kajian ini adalah untuk mengetahui selanjutnya perkembangan genotip-genotip berdasarkan musim-musim dan perbandingan dengan kajian sebelumnya. Empat puluh genotip yang sama telah mengeluarkan biji tetapi paras steriliti telah menurun untuk sebahagian genotip.

Keputusan daripada musim penanaman pertama dan kedua menunjukkan sifat-sifat agronomi adalah dipengaruhi dengan bererti oleh faktor genotip yang berbeza.

Analisis korelasi telah mengesahkan sebahagian sifat-sifat kuantitatif seperti bilangan 'tillers' yang subur, bilangan biji bagi setiap 'spike' dan berat 1000 biji adalah sifat-sifat penting yang mempunyai pertalian secara langsung terhadap peningkatan hasil.

Empat puluh germplasma yang dapat menghasilkan biji telah dipilih untuk kajian terakhir. Jangkitan *Helminthosporium* pada daun terdapat dalam daripada scale 1-9. Empat jenis genotip didapati dengan jangkitan minimum (DI-1). Enam jenis genotip menghasilkan biji berkilat hampir sama seperti normal, tetapi rendah bagi berat 1000 biji dibanding dengan biji normal. Bagaimanapun berdasarkan faktor yang mempengaruhi hasil dan kualiti biji, akhirnya tujuh jenis genotip iaitu barisan 13, 28, 31, 45, 58, 72, dan 73 telah dikenalpasti sebagai pilihan terbaik dari sejumlah 175 jenis genotip. Barisan ini nampak lebih berpotensi untuk kajian selanjutnya di persekitaran, Malaysia Melalui pengenalan gandum sebagai tanaman bijian di Malaysia ia boleh mengurangkan sebahagian besar pengaliran pertukaran luar.





# CHAPTER I

## INTRODUCTION

Wheat is a short term cereal crop of Graminae family, which comprises some 600 genera and more than 5000 species. All wheat, whether wild or cultivated, belong to the genus *Triticum*, of which 14 species are commonly utilized for domestic use. The species are subdivided into three group namely diploid, tetraploid and hexaploid, base on the number of chromosomes in their reproductive cells - 7, 14 and 21, respectively (Aylroyd and Doughty, 1970). Wheat have a history of diversity and since ancient time consumed by human and animal. The most consumed species is *Triticum aestivum*, which is also known as bread wheat. Tetraploid durum wheat (*Triticum durum*) have a wide usage such as spaghetti, noodles and macaroni, whereas triticale (a hybrid between wheat and rye, *Triticale* spp.) is a very important for it's high yielding and also for human, poultry and animal consumption.

In Malaysia, wheat is familiar with the name of "Gandum". In Bangladesh, it is known as 'Gom'. Wheat is the number one food grain consumed directly by humans, and its production leads all other crops including rice, maize and potatoes ( Briggles and Curties,

