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REACTION OF A COLLECTION OF TRITICUM SPECIES AND TRITICALES TO CROWN ROT (GIBBERELLA ZEAE)

By G. S. PURSS, M.Sc.Agr.

SUMMARY

No evidence of complete resistance or immunity to crown rot (*Gibberella zeae*) was detected in glasshouse studies of a wide range of *Triticum* species and *Triticales*. Similarly no such resistance was found in varieties resistant to head blight (*G. zeae*). The conclusion is drawn that further attention should be given to the field resistance currently available in a number of varieties.

I. INTRODUCTION

Gibberella zeae (Schw.) Petch has been described as the cause of crown rot in various gramineous hosts in Queensland (Purss 1969). The field reaction of varieties of hexaploid wheat has also been given (Purss 1966; Wildermuth and Purss 1971). The purpose of this paper is to report upon the reaction in the glasshouse of a wide range of *Triticum* species and *Triticales,* representing various levels of ploidy and originating initially from a wide geographic range.

The collection was made available to the author by Dr. W. J. R. Boyd, Institute of Agriculture, University of Western Australia, having originated from the University of Manitoba, Canada. Seed of varieties described by Schroeder and Christensen (1963) as exhibiting degrees of resistance to head blight, caused by *G. zeae,* was obtained from Dr. J. C. Craddock, U.S.D.A., Beltsville, U.S.A., and also included in the study.

II. METHODS AND MATERIALS

Crown rot reaction was assessed in the glasshouse on plants obtained by sowing seed which had been inoculated previously with a spore suspension of *G. zeae* (Purss 1966). A mixture of many isolates of the fungus was used, each obtained from wheat plants affected by crown rot. A spore concentration of 600,000 per ml was employed. The seed was sown in pots of sterilized soil as previously (Purss 1969), one pot to a treatment. In most cases the amount of seed available was very small with the result that the reported findings have been restricted to treatments represented by a minimum of four plants. Local varieties—Gala with a high field resistance and Puseas with a high susceptibility—were included as checks.

Final assessment for disease was made soon after the plants had come out in head. In some cases the hybrids did not head under the conditions of the experiment and assessment was then made after a period of approximately 5 months. Plants were considered diseased when at least the first internode above the crown on one or more tillers was completely discoloured brown.

III. RESULTS

In many lines plants died completely before heading. The results of the tests of the varieties selected because of their reaction to head blight in the U.S.A. appear in Table 1. In Table 2 a list of all the material from Dr. Boyd which was completely susceptible is given. Material exhibiting reactions less than completely susceptible is recorded in Table 3.

TABLE 1

COMPARISON OF THE REACTION OF SOME NORTH AMERICAN AND QUEENSLAND WHEAT VARIETIES TO CROWN ROT IN STERILIZED SOIL

Variety	Previous Record of Reaction to *G. zeae*	No. of Plants	Percentage Plants which Failed to Produce Effective Heads	Percentage Plants with Typical Crown Rot
Puseas	*Fully susceptible to crown rot in Queensland	15	100	100
Gala	*Possesses measure of field resistance or tolerance to crown rot in Queensland	16	75	100
Erythrospernum	†Resistant to head blight in U.S.A.	20	100	100
Frontana	†Resistant to head blight in U.S.A.	20	85	100
Lee	†Partially resistant to head blight in U.S.A.	16	81	100
Rival	†Tolerant of head blight in U.S.A.	3	100	100
Thatcher	†Susceptible to head blight in U.S.A.	14	100	100

* Purss (1966).
† Schroeder and Christensen (1963).

IV. DISCUSSION

The results indicate that no outstanding resistance is available within the material tested. It would seem desirable, however, that species such as *Agropyron elongatum* and hybrids derived from them should be examined more closely. The wide susceptibility encountered in this work does not, however, give reason for optimism in such a study.

It is important to emphasize that the method of testing used is a severe one which did not detect the levels of field resistance possessed by Gala. However, in this study the object was to detect complete resistance or immunity which could be conveniently handled in a breeding programme. Having failed to find any convincing evidence of the presence of such a resistance, it is necessary to investigate techniques which will consistently detect the lower level of resistance currently available in a number of varieties (Wildermuth and Purss 1971). Indications from tests described elsewhere (Purss 1971) are that unsterilized soil may offer a more suitable medium for this work.

The resistance to head blight in varieties such as Erythrospernum and Frontana does not bestow a high level of crown rot resistance. This perhaps is not surprising in view of evidence that crown rot is caused by a specialized pathogenic race of *G. zeae* (Purss 1971).

TABLE 2

A COLLECTION OF *Triticum* SPECIES, HYBRIDS AND OTHER RELATED MATERIAL COMPLETELY SUSCEPTIBLE TO CROWN ROT IN STERILIZED SOIL

Accession No. (W.A.)*	—
633	*Triticum dicoccoides* var. *kotschyanum*
645	*T. dicoccum* var. *atratum*
650	*T. dicoccum* var. *mitchellii*
656	*T. dicoccum* var. *arras*
658	*T. dicoccum* var. *rufum*
661	*T. dicoccum* var. *farrum* conv. *volgense*
662	*T. turgidum* var. *lusitanicum*
663	*T. turgidum* var. *gentile*
664	*T. turgidum* var. *megalopolitanum*
666	*T. turgidum* var. *buccale*
667	*T. turgidum* var. *salomonis*
668	*T. turgidum* var. *dreischianum*
670	*T. turgidum* var. *speciosum*
671	*T. turgidum* var. *speciosissimum*
672	*T. turgidum* var. *plinianum*
675	*T. turgidum* var. *pseudo-mirabile*
676	*T. turgidum* var. *rubri-album*
677	*T. turgidum* var. *melanatherum*
679	*T. turgidum-nigrobarbatum*
681	*T. durum* var. *reichenbachii*
684	*T. durum* var. *hordeiforme*
685	*T. durum* var. *murciense*
686	*T. durum* var. *erythromelan*
687	*T. durum* var. *italicum*
688	*T. durum* var. *apulicum*
689	*T. durum* var. *niloticum*
691	*T. durum* var. *australe*
692	*T. durum* var. *stebuli*
693	*T. durum* var. *leucurum*
694	*T. durum* var. *affine*
696	*T. durum* var. *melanopus*
697	*T. durum* var. *hordeiforme*
698	*T. durum* var. *melanopus* conv. *pyramidale*
702	*T. durum* var. *leucurum*
703	*T. durum* var. *hordeiforme*
705	*T. orientale* var. *insigne*
706	*T. orientale* var. *notabile*
709	*T. polonicum* var. *pseudo-martinari*
711	*T. polonicum* var. *eucompactum*
713	*T. polonicum* var. *nigro-barbatum*
716	*T. pyramidale* var. *recognitum*
717	*T. pyramidale* var. *pseudo-copticum*
718	*T. pyramidale* var. *arabicum*
719	*T. pyramidale* var. *thebaicum*
720	*T. pyramidale* var. *albo-rubrum*
725	*T. persicum* var. *rubiginosum*
727	*T. persicum* var. *stramineum*
733	*T. palaeo-colchicum* var. *schwamlicum*
734	*T. abyssinicum* var. *arraseita*
737	*T. vulgare* var. *graecum*

* Number given represents the University of Western Australian Accession No.

TABLE 2—continued

A Collection of *Triticum* Species, Hybrids and Other Related Material Completely Susceptible to Crown Rot in Sterilized Soil—*continued*

Accession No. (W.A.)*	—
740	*T. vulgare* var. *meridionale*
744	*T. vulgare* var. *pseudo-barbarossa*
758	*T. compactum* var. *icterinum*
767	*T. compactum* var. *creticum*
768	*T. compactum* var. *crassicaps*
775	*T. spelta* var. *album*
776	*T. spelta* var. *alefeldii*
791	*T. vavilovii* var. *vaneum*
792	*T. fungicidum*
794	*T. aethiopicum* Jakulz var. *atrato-sanquineum* Vav.
800	*T. aestivum* var. *erythrospermum*
809	*T. aestivum* var. *albidum*
810	*T. aestivum* var. *nigriaristatum*
811	*T. aestivum* var. *graecum*
831	*Aegilops longissima* × *T. persicum*
838	*T. durum* × *Ae. ovata*
857	*T. dicoccum* × *Ae. squarrosa*
858	*T. durum* (Pented) × *Ae. squarrosa*
861	*T. durum* (Golden Ball) × *Ae. squarrosa*
863	*T. turgidum* var. *nigro-barbatum* × *Ae. squarrosa*
866	*T. persicum* var. *fuliginosum* × *Ae. squarrosa*
868	*T. durum* (Carleton) × *Secale cereale*
869	*T. dicoccum* × *S. cereale*
870	*T. dicoccoides* × *S. cereale*
872	*T. durum* (Stewart) × *S. cereale* (Prolific)
874	*T. persicum* × *S. cereale*
876	*T. aestivum* (Chinese) × *S. cereale* (self-fertile Dakold)
879	*T. aestivum* (Prelude) × *S. cereale* (Prolific)
891	*T. vulgare* × Rye (awned)
899	*T. vulgare* × *S. cereale*
929	*T. aestivum* (Kharkov M.C. 22) × *S. cereale*
930	*T. aestivum* (Kharkov M.C. 22) × *S. cereale* (57D2.10)
931	6B259 × *S. montanum*
—	*Triticale* (33 separate lines tested) being selections of inter-crosses between primary triticales.

* Number given represents the University of Western Australian Accession No.

TABLE 3

Species and Hybrids in which Some Plants Survived Following Inoculation with *G. zeae.*

W.A. Accession No.	Species or Hybrid	Reaction
797	*T. carthlicum* var. *stramineum* . .	5/5* plants diseased but 2 only slightly
837	*T. durum* (Stewart) × *Agropyron elongatum* (2n = 14)	0/3 plants diseased in first test but 32/52 diseased in subsequent tests
855	*T. aestivum* (Chinese Spring) × *A. elongatum*	5/7 plants diseased in first test. 23/49 in subsequent test

* First figure indicates diseased plants, second figure total number tested.

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The author is an officer of Plant Pathology Branch, Queensland Department of Primary Industries, and is now stationed at Brisbane.