12 March 1988

1. Lumpkin, T. A. and Plucknett, D. L., *Econ. Bot.*, 1980, **34**, 111.
2. Zimmerman, W. J., *Ann. Bot.*, 1985, **56**, 689.
3. Rajarathinam, K. and Padhya, M. A., *Proceedings of the National Seminar on Some Applied Aspects of Physiology, Taxonomy and Ecology of Flowering Plants*, M.S. University of Baroda, Baroda, 1987, (in press).
4. Rajarathinam, K. and Padhya, M. A., *Int. Rice Res. Newsl.*, 1987, **12**, 54.
5. Watanabe, I., Berja, N. S. and Alimagno, V. B., *Int. Rice Res. Inst. Res. Paper Ser. No. 11.*
6. Peters, G. A. and Mayne, B. C., *Plant Physiol.*, 1974, **53**, 820.
7. Bulen, W. A., *Arch. Biochem. Biophys.*, 1956, **62**, 173.
8. Kanamori, T. and Matsumoto, H., *Arch. Biochem. Biophys.*, 1972, **125**, 404.
9. Sodek, L. and DaSilva, W. J., *Plant Physiol.*, 1977, **60**, 601.
10. Ray, T. B., Peters, G. A., Toia, R. E. and Mayne, B. C., *Plant Physiol.*, 1979, **62**, 463.
11. Nogatani, H. H., Shimizu, M. and Valentine, R. C., *Arch. Microbiol.*, 1971, **79**, 164.

AGROPYRON SPECIES AS COLLATERAL HOSTS FOR BLACK RUST OF WHEAT

R. N. BRAHMA

IARI Regional Station, Wellington 643 231, India.

DURING the last several years occurrence of black rust [*Puccinia graminis* var. *tritici* (Pers.) Eriks. & Henn.] was observed on *Agropyron yukonense* Scribn. & Merrill, *A. imbricatum* Roem. & Schult., *A. tauri* Boiss. & Bal., *A. intermedium* var. *trichophorum* (Link.) Haloe., *A. libanoticum* Hack. ex Kneuk., *A. scabriglume* (Hackel) L. Parodi, *A. dasystachium* (Hook) Scribn. and *A. batalinii* (Krassn.) Roshev., maintained at the IARI Regional Station, Wellington. The occurrence of black rust was observed on *A. yukonense* throughout the year, while on the other *Agropyron* spp. this occurred mainly during *kharif* season (June–October). Prasada[1] observed the occurrence of uredinial and telial stages on leaves, stems and ears of *A. semicostatum* and *A. longearistatum* in the Shimla hills. However, on inoculation, there was no infection on the differentials of *P. graminis tritici*. This led him to propose the rust as a variety of *P. graminis* and proposed the name *P. graminis* var. *agropyri* (Pers.) Mehta and Prasada.

The rust was isolated from the uredinial pustules occurring on leaves or stems of *Agropyron* spp. and cross-inoculations were carried out on cv Agra local or wheat. Isolates from all the *Agropyron* spp. infected Agra local wheat heavily. The isolates were further tested on 12 International Standard Differentials[2] and on 3 supplementary differentials for race identification. Reaction types produced by single spore cultures of the isolates on differential hosts are presented in table 1.

The isolate from *A. yukonense* produced reaction types identical to those of pathotype 117A, while those from other *Agropyron* spp. produced reaction types identical to those of pathotype 40A. The pathotype 40A is the most common on wheat in the Nilgiri hills, though in case of pathotype 117A, the

Table 1 *Infection types produced by Puccinia graminis tritici pathotypes from Agropyron spp.*

	International differentials[2]												Supplementary differentials		
Pathotypes	a	b	c	d	e	f	g	h	i	j	k	l	m	n	o
117A (S.S.)	4	4	0;	0;	4	4	4	4	4	4	4	0; − 1	4	4	0;
Agropyron yukonense isolate	4	4	0	0	4	4	4	4	4	3	4	0;	4	4	0
40A (S.S.)	4	4	4	4	4	4	4	4	4	0; − 1	4	0; − 1	4	4	4
Agropyron spp. isolate	4	4	4	4	4	4	4	4	4	0;	4	0;	4	4	4

a-Little club; b-Marquis; c-Reliance; d-Kota; e-Arnautka; f-Mindum; g-Spelmar; h-Kubanka; i-Acme; j-Einkorn; k-Vernal; l-Khapli; m-Charter; n-Yalta; o-E 535.

present report appears to be the first record from this hill. Thus it is evident that the rusts occurring naturally on *Agropyron* spp. and wheat are the same, and *A. yukonense* and the other *Agropyron* spp. are the collateral hosts of pathotypes 117A and 40A respectively. The existence of specialized form of *P. graminis tritici* on *Agropyron* spp. can be ruled out, since no *Agropyron* sp. is known to occur naturally in the Nilgiri hills. Some *Agropyron* spp. have been reported to take infection of *P. graminis tritici*[3-5].

Thanks are due to Mr S. Sambasivan for assistance.

19 March 1988; Revised 18 April 1988

1. Prasada, R., *Indian J. Agric. Sci.*, 1947, **17,** 137.
2. Stakman, E. C. and Levine, M. N., *Tech. Bull. 10.* Univ. Min. Agric. Exp. Stn, 1922, p. 1.
3. Hassebrauk, K., *Arb. Biol. Reichs. Land. Forstw.*, 1932, **22,** 165.
4. Hiratsuka, N. and Miyashita, S., *Jpn. J. Breed.*, 1954, **A1,** 31.
5. Vasudeva, R. S., Joshi, L. M. and Lele, V. G., *Indian Phytopathol.*, 1958, **6,** 39.

INTERSPECIFIC HYBRID BETWEEN *AMARANTHUS SPINOSUS* (SECTION AMARANTHUS) AND *A. VIRIDIS* (SECTION BLITOPSIS)

V. K. MALLIKA, K. V. PETER and C. RAMACHANDRAN
Department of Olericulture, College of Horticulture, Vellanikkara 680 654, India.

The genus *Amaranthus* is divided taxonomically into two sections—Amaranthus Sauer (Amarantho-typus Dumort) and Blitopsis Dumort. The prominent axillary inflorescences and trimerous flowers distinguish Blitopsis from Amaranthus having prominent terminal inflorescences and pentamerous flowers[1]. Based on cytogenetical features, breeding systems and morphological characters, Khoshoo and Pal[2] established the identity of these two sections. Also a number of naturally occurring hybrids were reported within each section[3]. However, no report is available on the existence of natural hybrids or on the successful attempt of interspecific hybridization between these two sections. In this paper, we report the first success of hybridization between two wild cosmopolitan species, *A. spinosus* (n = 17) and *A. viridis* (n = 17) belonging to sections Amaranthus and Blitopsis respectively.

Artificial hybridization was attempted by taking *A. spinosus* as female parent and *A. viridis* as male parent. The two species do not seem to be easily compatible. The hybrid was produced by removing the terminal part of the panicle consisting of male flowers in *A. spinosus* and then dusting with the *A. viridis* pollen on to the receptive stigmas. Pollination was restricted to only a single branch of the *A. spinosus* plant because of the limited pollen production in *A. viridis*. The hybrid seedling could be distinguished from among the selfed seedlings even at early stages due to the presence of broader and thicker leaves and rosetted growth. The hybrid plant flowered only after three months by which time the parents had almost completed their flowering. Meiotic studies were carried out in the parent species and interspecific hybrid using pollen mother cells, for which young inflorescences were fixed in Carnoys II fluid (6 alcohol : 3 chloroform : 1 acetic acid) mixed with a few drops of saturated ferric acetate solution. After 48 h of fixation, the buds were squashed in 1% acetocarmine[4].

The hybrid plant, unlike the parents had a short and sturdy stature tending to become perennial in growth habit (figure 1). The stem was stout and strong with very short internodes. The leaves were typically ovate with a leathery consistency. In the hybrid, an overall dominance of major *spinosus* characters were observed for the presence of axillary spines, distinct placement of pistillate and staminate florets, size of the florets, pentamerous symmetry, etc. (figure 2). The staminate florets were limited to a small distal area of the panicle; but the pistillate flowers were produced profusely towards the proximal side. Most of the male flowers were barren but a few contained 5 stamens. The male flowers failed to open and the anthers dried off without any dehiscence.

Meiosis was quite regular in both the parents and 17 II were observed at metaphase I stage (figures 3 and 4). The bivalents showed one or two chiasmata and normal disjunction. Also pollens and seeds were quite fertile. The interspecific hybrid, on the other hand, showed an average frequency of 14.37 bivalents and 5.25 univalents at metaphase I stage of meiosis (table 1, figures 5 and 6). The univalents failed to orient at metaphase I, and led to abnormalities at subsequent stages. Anaphase I was often characterized by unequal distribution, lagging chromosomes, dicentric bridges, fragments, etc. (figures 7 and 8). PMC also showed abnormalities in the second meiotic division in the form of asynchronous orientation and disjunction at metaphase II