the particular index $m = 0$, then it is true for every fixed m. Since the asymptotic proportion reduces for $m = 0$ to the prime number theorem[4], the proof is complete.

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[1] Cf., for example, Borel, E., and Deltheil, R., "Probabilities-Erreurs" (Collection Armand Colin, No. 34, art. 67 and art. 66; 1934).

[2] Erdös, P., and Kac, M., "The Gaussian Law of Errors in the Theory of Additive Number Theoretic Functions", *Amer. J. Math.*, **62**, 738–741 (1940).

[3] Gauss, C. F., "Werke", **101**, 11 (1917).

[4] Cf. Ingham, A. E., "Distribution of Prime Numbers". (Cambridge Tracts in Mathematics and Mathematical Physics, No. 30.)

Rust-Resistant Wheats for Egypt

OUR results resemble those obtained by Mehta and Pal[1] in India so closely that we are prompted to report them here.

All three rusts of wheat occur in Egypt, but the greatest loss in yield is caused by black rust on *vulgare* wheats in the Delta; our data indicate that the average annual loss is not less than 10 per cent of the possible yield, or about 2½ million bushels. The barberry plays no part here in the annual recurrence of black rust, for it is not found in or near Egypt, and wheat plants are so rarely found in summer that it is unlikely that they carry over the rust. Air-borne spores of black rust have, however, been found coming from the north-west[2] and it may be that this is the main source of infection.

Indian *vulgares* are better suited to Egyptian conditions than any other imported wheats (with the exception of one Italian variety Mentana), and Egyptian *vulgares*, known as Hindi wheats, are of Indian origin. Hindi and Indian wheats have all been found to be highly susceptible to black rust in Egypt, and interspecific crossing was thus resorted to in an attempt to obtain a resistant *vulgare*. We have produced a moderately resistant *vulgare* variety Mabrook from Giza 7 (*vulgare*) × Beladi 42 (*pyramidale*) which gives about 17 per cent higher yield than Hindis in the Delta, mainly because of its increased seed size and weight.

A large number of imported varieties have been tested for their resistance to black rust in Egypt, and as was the case in India we have found some *vulgares* with a promising degree of resistance in a group of Kenya wheats kindly supplied by the Director of Agriculture, Kenya, and by the Director of Plant Breeding, Department of Agriculture, New South Wales, Australia. Under Egyptian conditions these varieties are poor yielders and, according to our requirements, have other undesirable characters.

Since 1936 we have been crossing them with Egyptian wheats and we have obtained some F_4 and F_5 lines which are very resistant, give high yields and possess other desirable characters. *UX9M1A3* (Kenya) crossed with Giza 7 has given lines which are more resistant than the parents and in fact are almost completely resistant. Giza 7, from Federation × Indian 7, is less susceptible than Hindis and is our best quality Egyptian wheat. The Kenya parent shows quite a high degree of resistance, and we are informed that it is of unknown hybrid origin. We find that it has a gene for waxless foliage which is the dominant allelomorph of a gene for waxy, whereas waxy is usually dominant to waxless in *vulgare*. This indicates that it may have arisen from an interspecific cross, obtaining the dominant waxless and its rust resistance from the tetraploid parent.

The physiological races of black rust in Egypt have not been determined, but the above evidence suggests that they may be the same as those found in India.

The discovery of resistant *vulgares* has simplified our problem, and it appears that already we have made good progress towards the production of a resistant variety which is suited to Egyptian conditions and requirements.

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[1] Mehta, K. C., and Pal, B. P., NATURE, **146**, 98 (1940).

[2] Jones, G. H., Bull. No. 146, Egyptian Min. of Agric. (1935).

Riboflavin in Black Pepper

Fixen and Roscoe[1] quoting Murthy[2] place the fresh green berries of *Piper nigrum* extraordinarily high in the list of riboflavin-containing materials. Commercial black pepper, which consists of the dried berries of this plant also picked in the green stage, was considered as a possible source of riboflavin. When this product was assayed for riboflavin by the method of one of us[3] it was found to be devoid of riboflavin. An aqueous extract gave a very strong green fluorescence at high dilutions, but the solubility properties of the fluorescent material were not those of riboflavin but were similar to those of piperine. That this is the substance in black pepper which is responsible for the observed green fluorescence is confirmed by the strong fluorescence obtained with purchased piperine at a dilution in water of 1 in 2 million. Piperine in alcohol solution gives a light blue fluorescence with ultra-violet light, and in chloroform a purple blue fluorescence is seen. The fluorescent material in black pepper behaves in a similar manner to piperine, whilst riboflavin gives a green fluorescence in both water and alcohol, and luminoflavin fluoresces green in alcohol, chloroform or water solutions.

Murthy uses an isolation method based on adsorption on fullers' earth, and admits the desirability of confirming the high value which he obtained for pepper by animal tests. We are of the opinion that when dealing with material of unknown fluorescent behaviour it is advisable to define riboflavin as a substance with a green fluorescence which is insoluble in chloroform and which after exposure to ultraviolet light in $N/2$ sodium hydroxide becomes chloroform-soluble without loss of fluorescence.

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[1] Fixen and Roscoe, *Nut. Abs. & Rev.*, **9**, 795 (1940).

[2] Murthy, *Ind. J. Med. Res.*, **24**, 1083 (1937).

[3] Shaw, *Quart. J. Pharmacol.*, **12**, 541 (1939).