

emphasized by one of us were that (i) experimental data must be obtained to find out whether particular strains of a selected crop will or will not respond to vernalisation, (ii) to obtain this information, experiments with different strains of crops should be undertaken in various regions and (iii) the study of the effect of prevailing aftersowing environmental factors of given regions on the life-cycle of both vernalised and untreated seeds is essential to evaluate the practical possibilities of vernalisation for agriculture.

It may well be that Rai No. 5 and Tori No. 7 do not respond to vernalisation but from the experimental work reported by Sen Gupta and Sen no definite conclusion seems to be justified for the following reasons:—

1. The maximum period of chilling used by the authors was only 30 days, a period which at least in the case of five strains of mustard referred to above we have found to induce only incomplete vernalisation. Wide variation in vegetative cycles as reported by the authors for Rai No. 5 and Tori No. 7 is usually one of the characteristics of an incompletely vernalised batch of seeds.

2. The fact that unspouted soaked seeds were chilled at 2-4° C. for different periods does not in itself ensure that they were properly vernalised. The authors have not given any idea of the conditions of the different batches of seeds after chilling, nor have they described the technique used. To induce effective vernalisation the life-activity of the embryo during the process of chilling must continue. It has been our experience^{1,3} that under effective chilling conditions a certain percentage of seeds in every batch under treatment will invariably sprout, and this is a visual indication that the life-activity of the embryos has not been suspended during the period.

3. There is no evidence that the authors have taken into consideration the full implications of their own final remark, a truism to all students of vernalisation work, "that for any conclusion arrived at, after vernalisation studies, the variety and the post-treatment environmental conditions should always be taken into account". For they have formed their conclusions from the data obtained from a single sowing of Rai No. 5 and Tori No. 7 on October 1, 1943.

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SELF- AND CROSS- INCOMPATIBILITY IN SOME DIPLOID SPECIES OF SOLANUM

PAL and Pushkarnath¹ and later Pushkarnath² have presented evidence showing that self- and cross-incompatibility in *S. Caldasii* and *S. subtilius* is genetical and is controlled

by a series of five oppositional factors. Further studies with these two species and with *S. chacoense* and E.P.C. 143 (an unidentified South American variety obtained from the Empire Potato Expedition, probably belonging to *S. subtilius*), have shown the presence of six additional factors which belong to the same allelomorphous series. The experimental evidence, briefly summarised below, shows that these six factors are distinct from the five reported earlier, thus bringing the total to eleven.

1. Family No. D-29—*S. Caldasii* var. 1 × *S. Caldasii* var. 07.—Crossing tests made with 14 F₁ plants gave four intra-sterile groups of plants, A₁, B₁, C₁, D₁, with 4, 3, 2 and 5 plants respectively, in each group.

2. Family No. D-34—*S. Caldasii* var. 07 × *S. Caldasii* var. 1.—This was the reciprocal of the previous cross and tests made with 15 F₁ plants indicated here also the presence of four intra-sterile groups of plants, W, X, Y and Z, in the proportion of 6, 4, 2 and 3 plants in each group respectively.

Further experiments proved, as was expected, that the A₁ class of family D-29 was identical, with the Y class of family D-34 and B₁ with W, C₁ with X and D₁ with Z. For this reason plants belonging to the classes W, X, Y and Z were eliminated from further tests.

3. Family No. C. 115—*S. Caldasii* var. 01 × E.P.C. 143.—Seventeen F₁ plants tested gave four groups of intra-sterile plants in the proportion of 4, 4, 6 and 3 plants. These groups of plants were designated as E₁, F₁, G₁ and H₁ respectively.

4. Family No. C. 198—*S. chacoense* var. 07 × *S. subtilius* var. V₁.—Out of 20 F₁ plants raised in this family 12 were tested and four intra-sterile groups of plants, I₁, J₁, K₁ and L₁ established with 2, 5, 4 and 1 plants in each of the groups respectively.

The four families referred to above, thus gave a total of 12 intra-sterile groups of plants (A₁ to L₁). Crosses made reciprocally, in all possible combinations, amongst these 12 groups of plants showed that these were cross-compatible, thereby indicating that the constitution of no two groups of plants was identical and that the six varieties used as parents in the above-mentioned series of crosses differed in respect of the pair of sterility factors present.

The genetical constitution of *S. subtilius* var. V₁ (S¹S³), *S. Caldasii* var. 01 (S¹S⁵) and *S. Caldasii* var. 07 (S²S⁴), which have been used in the above crosses, was already established by our previous studies and it was known that these varieties between them carried five sterility factors. The present series of crosses was designed to discover whether any of these factors was present in the other three varieties used in the crosses.

The plants of the 12 intra-sterile groups (A₁ to L₁) when crossed with the ten 'testers' carrying S¹S², S¹S³, S¹S⁴, S¹S⁵, S²S³, S²S⁴, S²S⁵, S³S⁴, S³S⁵ and S⁴S⁵ combinations of factors gave (with the exception of two doubtful cases) completely cross-compatible reactions. Therefore none of the 12 groups of plants had any of the above combinations of

factors in their constitution. The constitution of the three varieties, *S. Caldasii* var. 1, E.P.C. 143, and *S. chaceoense* var. 07 in respect of the sterility factors is, therefore, represented by S^6S^7 , S^8S^9 and $S^{10}S^{11}$ respectively and the 12 intra-sterile groups of plants have the following factorial constitution:—

$$\begin{array}{lll} A_1 = S^2 S^6 & B_1 = S^2 S^7 & C_1 = S^4 S^8 \\ D_1 = S^4 S^7 & E_1 = S^1 S^8 & F_1 = S^1 S^9 \\ G_1 = S^5 S^8 & H_1 = S^5 S^9 & I_1 = S^1 S^{10} \\ J_1 = S^1 S^{11} & K_1 = S^3 S^{10} & L_1 = S^3 S^{11} \end{array}$$

Apart from the above eleven factors it is very likely that there are also other 'S' factors in this allelomorphous series in the diploid *Solanums*. We have already found indications of the presence of some new factors in a sample of potatoes, E.P.C. 142, from the collection made by the Empire Potato Expedition. An exhaustive study is bound to increase their number still further.

The presence of the 'S' series of allelomorphs has been also discovered in two other species, *S. aracc-papa* and *S. Rybinii*. The behaviour of both these species in crossing tests, however, does not follow the simple mode of inheritance, as outlined in the oppositional factor hypothesis.

S. Rybinii under normal conditions is highly self-incompatible. Twenty-two plants obtained from a natural berry showed irregular behaviour in the crossing tests. The findings of Carson and Howard³ in this connection are interesting. Crosses of this species have been obtained with S^1S^3 plants of *S. subtilius* and the progenies are under study.

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PUSHKARNATH.

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EFFECT OF MERCURY ON MICRO-ORGANISMS

Of all the preventive measures,^{1,2} suggested in the storage of grains against insects, the easiest and the most striking is the lethal effect of mercury on the eggs of insects commonly found in places where grains are stored. Besides insects, however, fungi and bacteria also infest these storage places, more particularly under wet conditions.

The effect of mercury on some common types of fungi and bacteria has been investigated.

Pure cultures of a few representative fungi (glucose agar media) and bacteria (beef extract media) were taken and mercury was mixed in some tubes, while in others it was

kept at one end of the test tube. These tubes of pure cultures of the organisms were kept under mercury vapour for about two weeks at a temperature between 25° to 30° C. The growth of these were in no way affected as compared with the untreated controls. Re-inoculations were then made from the mercury-treated cultures; the growth of the organisms occurred as usual.

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FERTILISATION IN ISOACHLYA ANISOSPORA (de BARY) COKER VAR. INDICA SAK. et BHAR.

THE question of fertilisation in the family Saprolegniaceæ had been the subject of much controversy for a considerably long time. Earlier workers in the field like de Bary,¹ Humphrey² and Hartog^{3,4,5} held the view that antheridia, though present, were functionless. Trow^{6,7} was the first cytological investigator to demonstrate that fertilisation took place in the family Saprolegniaceæ. Since then fertilisation has been shown to occur in various genera, viz., *Achlya*, *Saprolegnia*, *Aphanomyces*, *Brevilegnia*, *Leptolegnia* and *Thraustotheca* Wolf, p. 464.⁸ In the genus *Isoachlya* also (Coker),⁹ it has been observed that antheridia and oogonia are present, but no cytological evidence as to the fertilisation has yet been reported.

The material for the present study was obtained from a local pond (Saksena and Bhargava)¹⁰ and was fixed in Raper's chromoacetic acid solution. Serial sections were cut 4 μ thick and were then stained with Gram's stain in the usual manner.

Along with the differentiation and maturation of the oospheres the formation of a multinucleate fertilisation tube from each antheridium takes place. Later on the fertilisation tube penetrates the oogonial wall and grows in between the oospheres (Fig. 1, F). When it reaches an oosphere its membrane gets ruptured and a single male nucleus is released into the oosphere. The male nucleus proceeds towards the female nucleus, which is usually located near the centre of the oosphere and the two nuclei come in contact (Fig. 2). The intervening nuclear membranes finally disappear and a fusion nucleus is thus formed. In Fig. 1, the two nucleoli are seen lying side by side in the fusion nucleus. Later on, these nucleoli also fuse.

The present investigation shows that fertilisation takes place in *Isoachlya anisospora* (de Bary) Coker var. *indica* Sak. et Bhar. by the discharge of a single male nucleus from the fertilisation tube into the oosphere, the male nucleus subsequently fusing with the female