

Meiosis in Tropical *Rhoeo discolor*

MEIOSIS in *Rhoeo discolor* growing under temperate conditions has been described by Bhaduri¹, Darlington^{2,3}, Sax⁴, Sax and Anderson⁵ and by Kato⁶, but the last-named author's work has not been available. An examination of two collections of tropical material, (1) from St. Augustine, Trinidad, and (2) from the Botanic Gardens, Port of Spain, has revealed certain interesting features which are reported below.

Metaphase associations are given in Table 1, for the two collections separately.

TABLE 1. METAPHASE ASSOCIATIONS IN *Rhoeo discolor*.

Coll.	Ring of 12	12	10-2	Chains				Total
				9-3	8-4	6-4-2	other	
(1)	6	9	3	3	1	3	15	40
%	15.0	22.5	7.5	7.5	2.5	7.5	37.5	100
(2)	5	10	3	2	3	2	5	30
%	16.7	33.3	10.0	6.7	10.0	6.7	16.7	100

In the first collection, none of the rings of twelve and two only of the chains were disjunctionally arranged, while the corresponding figures for the second collection were one and five respectively. Thus in only 5 per cent of P.M.C.s of the first collection and in 20 per cent of the second were there found disjunctional associations of twelve chromosomes. These figures indicate a considerably higher degree of irregularity than was found by Sax and Anderson⁵ and Darlington², who stated that rings occurred with a frequency of about 30 per cent, single chains about 45 per cent, and that a "bare majority" were disjunctionally arranged. Sax⁴ gave no details about association but noted that pairing was variable, that chains were more common than rings and that about half of the first divisions examined were disjunctional.

It would be interesting to know whether these differences are genetic or merely environmental in origin, particularly as Sax⁴ found varying degrees of asynapsis at lowered temperatures. Such variation emphasizes the dangers attendant on comparison of association frequencies estimated without any control of environmental error (cf. Myers and Hill⁷, Steinitz⁸ for review of environmental control of pairing, etc.).

An examination of cells between anaphase and telophase, that is, phases of separation in which the chromosomes could still be separately distinguished, yielded the following data (Table 2), in which are given the frequencies of the various types of separation observed, six to each pole, seven to one and five to the other, six to one and five to the other with a laggard, etc. In addition, a very few cells were seen with bridges but no fragments: they may be due to inversion crossing-over (Darlington², Bhaduri¹),

TABLE 2. ANAPHASE-TELOPHASE DISJUNCTION.

Coll.	6-6	7-5	6-1-5	6-2-4	6-3-3	7-1-4	5-3-4	5-2-5	Total
(1)	8	1	2	-	1	-	-	-	12
%	66.7	8.3	16.7	-	8.3	-	-	-	100
(2)	37	11	12	2	-	1	1	2	66
%	56.1	16.7	18.2	3.0	-	1.5	1.5	3.0	100

It will be seen that, in the two collections, 25.0 and 27.2 per cent of cells respectively contained at least one lagging chromosome (cf. the 45 per cent found by Bhaduri¹). There was a well-marked inter-

phase in which complete despiralization took place. In a total of 438 interphases and first telophases in which despiralization had occurred, only 17 (3.9 per cent) were seen in which a chromosome had not been included in one of the polar nuclei, a very marked reduction compared with anaphase. This is no doubt due to the relatively very great volume of the resting nuclei: it must be rare that a lagging chromosome is so placed that it avoids inclusion in the expanding nucleus, once despiralization starts. The few chromosomes that were not so included remained condensed, a situation which has been found in *Tradescantia bracteata* (Darlington³) and *Tripsacum laxum* in which an alternative behaviour was the formation of micro-nuclei (Dodds and Simmonds⁹). It may be surmised that the failure of despiralization is connected with the failure of loss of nucleic acids (cf. Darlington¹⁰), and it is suggested that a study of the behaviour of such excluded chromosomes in favourable material might prove helpful in the study of the nucleic acid cycle.

The presence of an interphase is interesting since Sax⁴ stated that "the chromosomes retain their individuality during interkinesis", thereby presumably implying that there was no interphase despiralization. Again, it would be interesting to know whether this is a genetic or environmental difference.

Second division appeared normal, but a few diads were seen in which one cell was at second telophase and the other had not divided at all. In view of the normally high degree of synchronization between cells of a diad, it is possible that such cells represented failure of the second division and might thus have given rise to diploid spores. One second metaphase was seen in which were present two chromosomes apparently joined end-to-end and which had presumably failed to disjoin at the first division. This failure of separation is in accord with the observation of Darlington² but constitutes an exception to his statement¹¹ that undivided associations generally separate during an interphase.

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¹ Bhaduri, P. N., *J. Genet.*, **44**, 73 (1942).

² Darlington, C. D., *J. Genet.*, **21**, 207 (1929).

³ Darlington, C. D., *J. Genet.*, **35**, 259 (1938).

⁴ Sax, K., *Cytologia*, **3**, 36 (1931).

⁵ Sax, K., and Anderson, E., *Genetics*, **18**, 53 (1933).

⁶ Kato, K., *Mem. Coll. Sci. Kyoto Imp. Univ.*, Ser. B, **5**, 139 (1930).

⁷ Myers, W. M., and Hill, H. D., *Bot. Gaz.*, **104**, 171 (1942).

⁸ Steinitz, L. M., *Amer. J. Bot.*, **31**, 428 (1944).

⁹ Dodds, K. S., and Simmonds, N. W., in the press.

¹⁰ Darlington, C. D., *Nature*, **149**, 66 (1942).

¹¹ Darlington, C. D., "Recent Advances in Cytology" (1937).

Plant Nutrients in the Sea

I HAVE recently been attempting a valuation of potential fish production of the banks of the Seychelles-Mauritius arc. The figures following indicate that the suggestion to increase the fertility of suitable parts of the sea by the addition of fertilizers¹ is an established process in certain places and circumstances in the ocean.

The estimated annual basic total catch (catch from professional fishermen only) of the Mauritius fisheries is 1,650 metric tons, derived almost entirely from