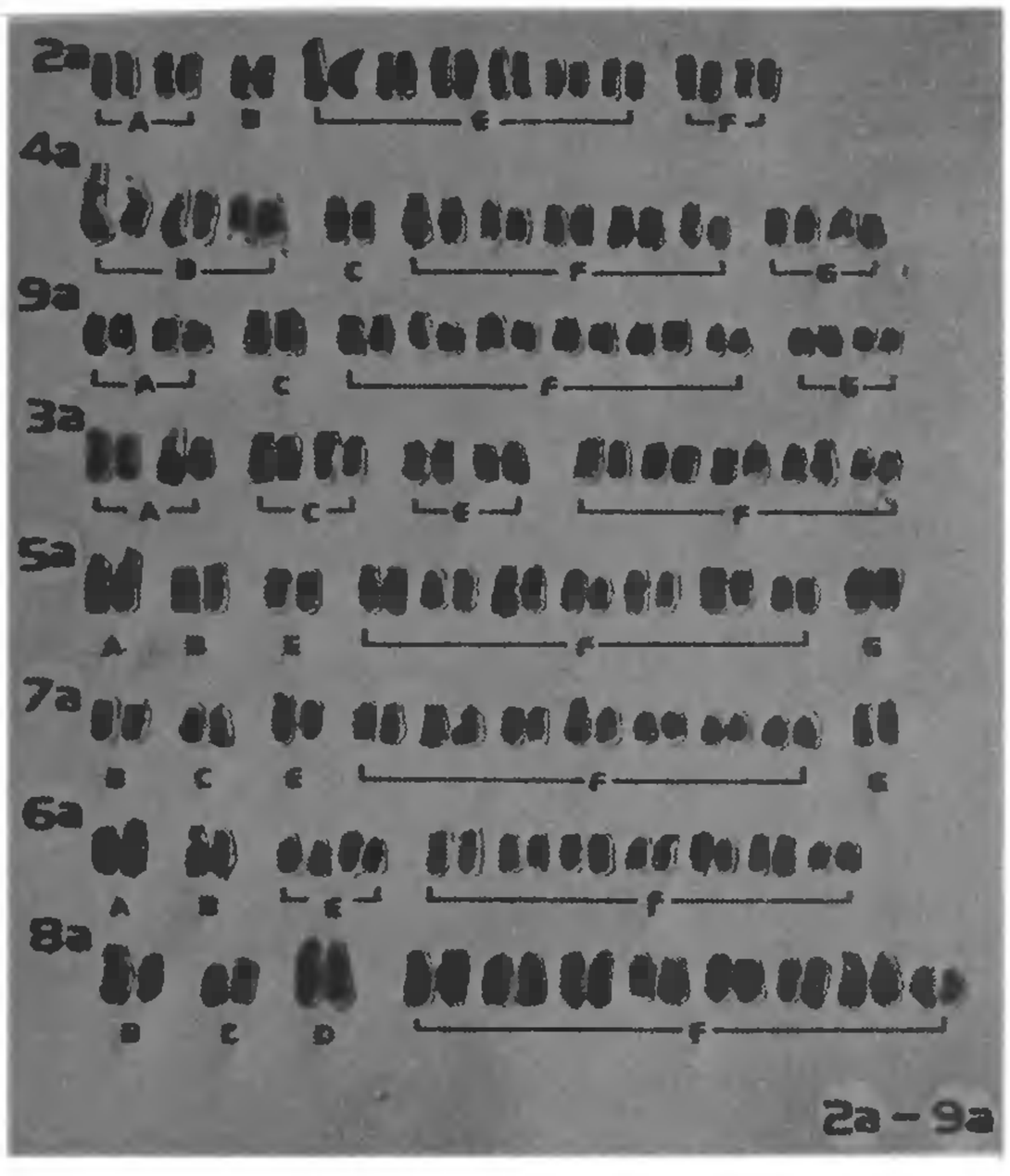

Figures 2a–9a. Comparison of karyograms of the varieties of *C. sativum* L. (× 1150).

The authors thank UGC, New Delhi, for financial assistance.

8 April 1988; Revised 13 June 1988

1. Sharma, A. K. and Bhattacharyya, N. K., *Genetica*, 1959, **30**, 1.
2. Hore, A., *Caryologia*, 1977, **30**, 445.
3. Subramanian, D., *Cytologia*, 1986, **51**, 488.
4. Mukhopadhyay, S. and Sharma, A. K., *Cytologia*, 1987, **52**, 831.
5. Kar, D. K. and Sen, S., *Cytologia*, 1985, **50**, 147.
6. Mukhopadhyay, S., *Curr. Sci.*, 1986, **55**, 1046.

EFFECT OF SAPONINS ON USTILOSPORE GERMINATION OF SMUT

N. JAITLY, K. WADHWANI, R. BANERJI*, G. MISRA* and S. K. NIGAM*

Botany Department, Lucknow University, Lucknow 226 007, India.

**Pharmaceutical Chemistry, National Botanical Research Institute, Lucknow 226 001, India.*

CERTAIN secondary plant constituents are known to possess the property of not only being cidal but very often used to arrest/check the growth and activity of several micro-organisms[1–3]. The present communication deals with the studies on the effect of saponins isolated and purified from the plants *Madhuca butyracea* Macbride, *Mimusops littoralis* L. (Sapotaceae), *Costus speciosus* Sm. (Zingiberaceae), *Momordica charantia* L. (Cucurbitaceae) and *Entada scandens* Roxb. (Mimosaceae)[4–6] on the germination of ustilospores of the three species of *Ustilago* viz., *U. cynodontis*, *U. scitaminea* and *U. tritici* and one species of *Cintractia*, i.e., *C. limitata*. The saponin from *C. speciosus* has steroidal aglycone moiety, i.e., diosgenin whereas the rest have triterpenoidal aglycones, viz., protobassic acid (*M. butyracea* and *M. littoralis*), entagenic acid (*Entada scandens*) and momordicosides (*M. charantia*) besides the usual sugar moieties such as xylose, arabinose, rhamnose and glucose. All the saponins were tested with four dilutions of 100% (1:1), (w/v). 50%, 25% and 1% against ustilospore germination taking 2,000 spores per ml following the method of Duran and Safeeulla[7] with slight modifications wherein, instead of using the watch glass, the spore suspension was inoculated in different dilutions of various saponins on a slide in a moist chamber with 100% relative humidity. The slides were incubated for 24 h at 30°C, stained in lactophenol and the per cent spore germination was recorded using sterilized distilled water for *Ustilago* species and potato decoction for *C. limitata*.

The effect of different dilutions of saponins of five plants varied on ustilospore germination. The inhibiting effect was observed at dilutions of 25–50% for *C. limitata*, that of 1–25% for *Ustilago cynodontis* and *U. scitaminea* and 50–100% for *U. tritici*. The saponins from *Costus speciosus* and *Madhuca butyracea* completely inhibited the ustilospore germination of *U. scitaminea* at all the dilutions. However, the former saponin also had similar inhibitory effect on the germination of *C. limitata* but in case of *U. cynodontis* it effected only 28% of ustilospore germination and which was almost equal (54.3) to the control (53.1%) in case of *U. tritici*. The saponin from *M. charantia* inhibited the ustilospore germinaiton of *C. limitata* at 50 and 100% dilutions only (table 1).

The saponins from *M. littoralis* (50% and 25% dilution) restricted the germination of ustilospore to the tune of 3.75 and 3.05% for *U. tritici*, *E. scandens* (100% dilution) to 8.6% for *C. limitata* and 7.9% for *U. tritici*, and *M. charantia* (100%) to 5.1% for *U. cynodontis* and 8.3% for *U. scitaminea*. However,

Table 1 *Per cent ustilospore germination of smuts in different dilutions of saponins*

Plant and family	Different dilution* (%)	*C. limitata*	*U. cynodontis*	*U. tritici*	*U. scitaminea*
M. butyracea	100	28.7 ± 1 6	59.7 ± 2.2	12.0 ± 3.6	—
(Sapotaceae)	50	23.3 ± 2.1	31 4 ± 1.6	33 5 ± 2.5	—
	25	50.2 ± 3.0	41.1 ± 1.5	45.7 ± 2.3	—
	1	62.3 ± 4.2	09.6 ± 1.6	70.0 ± 2.2	—
M. littoralis	100	45.7 ± 1.1	88.3 ± 4 4	—	76.0 ± 3.4
(Sapotaceae)	50	30.0 ± 2.6	35 5 ± 2.7	3.7 ± 0.4	43.3 ± 2.8
	25	24.4 ± 0.7	24.8 ± 1.2	3 0 ± 4.0	40.0 ± 0.6
	1	15.5 ± 0.7	22.1 ± 4 6	50.5 ± 3.4	26.3 ± 2.5
C. speciosus	100	—	—	—	—
(Zingiberaceae)	50	—	—	—	—
	25	—	—	—	—
	1	—	28.1 ± 3 4	54.3 ± 3.2	—
M. charantia	100	—	5.1 ± 0.8	26.0 ± 1.2	8.3 ± 0.4
(Cucurbitaceae)	50	2.1 ± 0.2	46 4 ± 2.9	63.0 ± 4.9	61 6 ± 1.6
	25	40.0 ± 1.4	69.5 ± 1.5	63.3 ± 3.6	66.4 ± 1.8
	1	58.0 ± 8.4	20.6 ± 4.2	—	33.9 ± 1 5
E. scandens	100	8.6 ± 0.3	71.2 ± 1.1	7.9 ± 1.1	72.1 ± 4.3
(Mimosaceae)	50	10 0 ± 0.9	64.5 ± 2.7	56.2 ± 2.7	55.9 ± 4.4
	25	30.0 ± 2 6	63.3 ± 4.0	59.2 ± 2.2	44.3 ± 1.7
	1	60.6 ± 2.4	5.1 ± 1.1	86.0 ± 2.9	38.0 ± 1.5
Control		82.2 ± 2.8 (Potato ext)	86.2 ± 3.1 (Water)	53.1 ± 2.8 (Water)	64.0 ± 3.0 (Water)

*100% = 1.1 (w/v).

the saponins of *E. scandens*, *M. butyracea* and *M. charantia* accelerated the ustilospore germination of *U. tritici* and *M. littoralis* and *E. scandens* also promoted the germination of *U. scitaminea* (table 1).

The saponins have been reported to exhibit antimicrobial and antifungal activities[8] but Wolters[9] reported the fungistatic action of many saponins against 15 phytopathogenic fungi and observed varied sensitivity to different saponins. The most sensitive fungi were *Sclerotinia fruticola*, *Claviceps purpurea*, *Trichothecium roseum*, *Piricularia oryzae* and *Fomes officinalis*.

It can, however, be concluded from these studies that the inhibitory effect of the saponins from *M. butyracea* and *C. speciosus* was most pronounced. Moreover, the saponins in terms of inhibition were most effective against *Cintractia* as compared to the species of *Ustilago*.

14 April 1988; Revised 8 July 1988

1. Fawcett, C. H. and Spencer, D. M., *Annu. Rev. Phytopathol.*, 1970, **8**, 403.
2. Misra, S. B. and Dixit, S. N., *Acta Bot. India*, 1979, **7**, 147.
3. Thepllyal, P. N. and Nene, Y. L., *J. Sci. Ind. Res.*, 1967, **26**, 289.
4. Banerji, R., Srivastava, A. K., Misra, G., Nigam, S. K., Singh, S., Nigam, S. C. and Saxena, R. C., *Indian Drugs*, 1979, **17**, 6.
5. Banerji, R., Prakash, D., Patnaik, G. K. and Nigam, S. K., *Indian Drugs*, 1982, **20**, 51.
6. Nainan, M. O., Pandey, M. B. and Banerji, R., *Quart. J. Drug Res.*, 1979, **17**, 122.
7. Duran, R. and Safeeulla, K. M., *Mycologia*, 1968, **60**, 231.
8. Thakur, R. S. and Goswami, A., *Cromap*, 1979, **1**, 196.
9. Wolters, B., *Planta*, 1968, **79**, 77.

INTRASPECIFIC NUCLEAR DNA VARIATION IN *COLEUS FORSKOHLII* (LAMIACEAE)

J. R. BAHL and B. R. TYAGI
Central Institute of Medicinal and Aromatic Plants, Post Bag No. 1, P. O. RSM Nagar, Lucknow 226 016, India.

INTERGENERIC and interspecific variations in DNA content per nucleus among diploid plants have been