Cryptic Polyploidy and Variation of Chromosome Number in *Ribes nigrum*

THE examination of meristems in root tips and young ovules in the c_2-generation bushes grown from seed of colchicine-induced tetraploid *Ribes nigrum* ($2n = 32$) showed that the chromosome number varies greatly from one to another. The lowest number found was 4, all numbers between 4 and 32 being observed. Statistics on the frequency of the different chromosome numbers shows that the distribution is in its main features binomial, the peak lying at the diploid number $2n = 16$. All numbers divisible by four are more frequent than might be expected on random distribution.

If we accept the axiom that the haploid chromosome set is the smallest chromosome combination for the viability of an individual cell[1], we may assume on the basis of the above observations that the primary haploid chromosome number of the genus is $x = 4$, the recent species being accordingly derived tetraploids. This is in accordance with Stebbins' hypothesis[2,3] that many woody plants which have been regarded as diploid actually are polyploid. The meiosis of certain *Ribes* hybrids[4] indicates that hybridization and amphidiploidy have played a part in the speciation of this genus. The formation of two separate and independent spindles in one cell has been established as the cause of the variation in the chromosome number. The original chromosome complement is divided between the two spindles. The autonomy of the separately dividing groups is to be found already in the resting nucleus, which in this case is more or less constricted. Between the mitotic cycles of the two chromosome groups synchronization disturbances are relatively common.

The occurrence of the split spindle and the timing disturbances in the divisions are assumed to be connected with structural changes in the chromosomes arising during the colchicine treatment[5]. Chromosomes are then broken, especially in the heterochromatic segments[5]. The amount of heterochromatin is thus variable, and consequently the nucleic acid metabolism is unbalanced. It seems to be a pertinent fact that structural changes disturb the balance of the mitotic genes[7] which regulate the nuclear cycle.

The occurrence of the diploids ($2n = 16$) in the progeny of the tetraploid bushes proves that the hypoploid cells also affect the offspring. As Upcott[8] has proposed in the corresponding case of *Primula kewensis*, a strong selection seems, however, to be effective among hypoploid cells. Only the most viable chromosome combinations are able to survive as functioning gametes.

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Aural Sensitivity and Heart Beats

MOST mains-actuated radio receivers when switched on have a greater or lesser degree of mains hum, which is readily audible so long as the programme is inaudible. With my own receiver I have always been conscious of a rhythmic pulsation in intensity under these conditions, which I have been inclined to attribute to some slight lack of balance in the electrical components of the set. On inquiry, I find that many people are aware of this rhythmic effect.

When burning damp logs on the fire during last winter, I noticed a similar rhythmic pulsation in the sound emitted by steam escaping from the ends of the logs, as well as in the even higher-pitched hiss produced when drops of water from the wood fell on to the hot bars, the effect being slightly more marked in the latter case. Later, I noticed that the mains hum pulsation of the radio receiver coincided in time with that from the fire. On feeling my pulse (or temporal artery) I discovered that the rhythm was that of the heart-beat, the intensity of the sound heard diminishing in each case for the duration of the 'beat'. When their attention was directed to the effect, I found that other people also noticed the same rhythmic pulsation of intensity with the heart-beat. I have noticed the same effect with the hiss of an oxyacetylene welder, with the sound of water flowing through the supply pipes when water has been drawn from the main tank, with waves breaking on the seashore, and in other cases.

There seemed little doubt that the effect must be connected in some way with the ear-drum. Since the drum is richly supplied with blood vessels, it follows that, corresponding to each surge of blood through the arteries, the drum will swell slightly and have increased inertia, so that its amplitude of vibration under constant stimulation will be reduced. Thus, when we are listening to a continuous source of sound of uniform intensity, an apparent diminution in intensity will be observed for the duration of each 'beat', and between beats the intensity will be greater and sensibly uniform.

Experiments with a beat-frequency oscillator fed to a pair of headphones were then carried out to see if the effect depends in any way on frequency. Whether the headphones were on the head or off (but still audible), no essential difference in the pulsation effect was noticeable at frequencies from 50 c./s. to the limit of audibility (14,000 c./s. for my left ear, and 12,000 c./s. for my right). Near the upper limit of audibility, however, the effect was distinctly more marked relatively than at somewhat lower frequencies, as it had been found to be with the hiss from water on the hot fire-bars as compared with the sound of steam issuing from the logs burning in the fire. At any given frequency, the audible effect was practically independent of the intensity of the sound, except that above the threshold of pain I found it impossible to detect any pulsation.

It was further observed that, when listening to a constant source of sound, the apparent intensity was reduced by biting the teeth firmly together, especially at higher frequencies. By performing this action rhythmically, a pulsation in intensity analogous to that produced by heart-beats was readily detectable. This effect also took place at all frequencies and for all intensities below the threshold of pain. It seems likely that it is caused by a variation in tension of the drum effected by the muscular effort of biting.