Switching flowers on and off

There is considerable evidence that flower formation in plants is triggered by a flower-promoting hormone, regardless of whether plant flowering depends on long periods of daylight, short periods of daylight or is independent of daylight. There is also some evidence for the existence of flower-inhibiting hormones in plants, but it has been sketchier than that for a flower-promoting hormone.

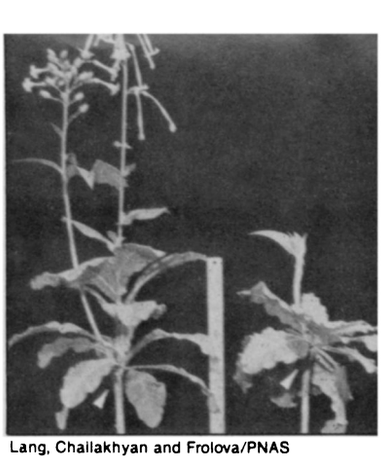
Now flower inhibitors in plants that are also capable of producing florigen have been unequivocably demonstrated by an American and two Soviet plant physiologists. They are Anton Lang of Michigan State University and M. Kh. Chailakhyan and I.A. Frolova of the K.A. Timiryazev Institute of Plant Physiology in Moscow. The results of their cooperative research, are reported in the June PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES.

The researchers sought to obtain direct evidence for the existence of flower-inhibiting chemicals in plants where the existence of florigen was already known. They chose for their studies three kinds of tobacco plants—trapezond, a tobacco plant whose flowering is not affected by the length of daylight to which it is exposed; Maryland mammoth, a tobacco plant that flowers in response to short periods of daylight, and *Nicotiana silvestris,* a tobacco plant that flowers in response to long periods of daylight.

They set about showing the existence of flower-inhibiting hormones by grafting their experimental plants to each other under various lighting conditions. First the Maryland mammoth and *N. silvestris* plants were maintained in their respective noninductive light periods—light periods in which no flower formation occurs. The Mammoth plants were then grafted to some trapezond plants, the *N. silvestris* to others. Part of each grafted trapezond plant was placed under long days and part under short days, and the flowering response of trapezond was measured under the two different lighting environments.

The researchers found that flower formation in the day-neutral trapezond plant was accelerated by graft union with the short-day mammoth plant when the grafts were exposed to short daylight periods, and by graft union with the long-day plant *N. silvestris* when the grafts were exposed to extended light periods (see illustration). These results indicate that the flower-promoting hormone florigen is present in the light-sensitive flowering plants and can be transferred to the light-neutral trapezond by grafting, because when the light-sensitive flowering plants were exposed to their ideal lighting conditions, the usual light-neutral trapezond speeded up its flowering.

On the other hand, when the short-day mammoth-trapezond grafts were exposed to long light periods, trapezond flowering was slightly delayed. Even more noteworthy, when long-day *N. silvestris*/trapezond grafts were exposed to short periods of light, trapezond flowering was significantly delayed, if not altogether suppressed, and trapezond plant growth also became stunted. These results strongly indicate that long-day *N. silvestris* possesses, under short-day (less-than-ideal) lighting conditions, potent flower-inhibiting and growth-regulating chemicals, and that it can transmit these chemicals to a plant that usually does not alter its flowering in response to light. Similar flower-inhibiting chemicals appear to be present, to a smaller extent, in the short-day plant mammoth. When mammoth-trapezond grafts were exposed to more light than mammoth usually needs, it transferred only modest flower-inhibiting capabilities to trapezond, whose flowering is usually not dependent on lighting conditions.



N. silvestris/ trapezond grafts exposed to long daylight (l) and short daylight (r). Left graft has speeded flowering, right graft, no flowering and stunted growth.

Lang, Chailakhyan and Frolova/PNAS

These results, the researchers conclude, constitute "the unequivocal demonstration of flower-inhibitory, growth-regulating substances in plants that are also capable of producing florigen. . . ."

The challenge now facing plant physiologists is to extract and identify both these inhibitors and florigen. □

Cocaine: Hazards still unclear

Sigmund Freud was among many creative individuals to shout the praises of cocaine. The drug, he and others have said, produces a sense of intense stimulation, psychic and physical well being and reduced fatigue. Over the past century, cocaine has been used not only for the above effects but also for medical, mainly anesthetic, purposes as well.

Still, hard information on the nature and effects of cocaine has been lacking, primarily because of its limited use. In recent years, however, the drug's use, or at least its popularity, appears to have grown. This situation prompted the National Institute on Drug Abuse (NIDA) to study the cocaine picture in the United States. And last week, NIDA released a four-year, $4 million study summarizing cocaine research in the United States.

While NIDA officials emphasize the potentially serious hazards of overuse of the drug, the 220-page study reports that there is little concrete evidence to suggest cocaine is dangerous when taken in moderate doses. And the use of cocaine, while apparently growing, is still considerably limited, mainly because of its limited availability and high street price.

Among clinical and laboratory study results of cocaine's effects on humans, NIDA reports that the euphoric effects of the drug, "including hyperstimulation and feelings of great power and mental clarity occur within minutes of use and can last up to 30 or 40 minutes." Physically, cocaine constricts blood vessels, stimulates the central nervous system and acts as a topical anesthetic. Among the possible "chronic and acute" effects are inflammation of nasal membranes and local-tissue death. However, contrary to past speculation, perforation of the nasal septum appears to be rare, the report states.

In addition, "there is good evidence that cocaine in moderate doses (10 to 25 milligrams intravenously or 100 milligrams intranasally) significantly increases both heart rate and blood pressure," NIDA reports. Heart-rate increases range from 30 to 50 percent and blood pressure (systolic) from 10 to 15 percent. Still, anecdotal reports of more serious reactions to high doses, such as hallucinations, paranoia, and tremors, have yet to be confirmed in systematic, controlled studies, says NIDA. Even though a rare occurrence, death *can* result from snorting or injecting cocaine, the report cautions, and the drug "can cause psychological dependence."

Data from several nationwide surveys shows that among persons 12 years old and up, 3 to 4 percent said they had tried cocaine and fewer than 1 percent said they had taken the drug within the month prior to the survey. In the 18 to 25-year-old group, the peak age group for all illicit drug use, 13.4 percent said they had tried cocaine, 2 percent within a month of the survey. Cocaine figured only rarely in cases of drug-related deaths and was seen infrequently in emergency room drug cases. The street cost of the drug is estimated at from $60 to $100 a gram.

SN Writer Wins Award

Joel Greenberg, behavioral sciences editor of SCIENCE NEWS, has won the American Psychological Foundation's 1977 National Media Award in the newspaper reporting category for an article on behavior modification that appeared in the Miami Herald last October. According to William Bevan, president of the foundation, the article "has made a noteworthy contribution to the public's understanding of psychology." Greenberg will receive the award Aug. 25 at the annual meeting of the American Psychological Association in San Francisco. He came to SCIENCE NEWS from the Herald in March of this year.