Table 1. Distribution of chromosome numbers in analyzed metaphases for each horse studied.

62	63	64	65	66	67
Norwegian fjord pony ♀					
1	1	48			
Prjewalski's horse ♂					
		1	1	37	1
Hybrid ♂					
	2	5	43		

chromosomes and a karyotype morphologically very similar to (if not identical with) the karyotype of *E. prjewalskii,* despite the fact that this animal may not be a pure Prjewalski's horse. This situation indeed would raise questions about the specificity of karyotype studies of specimens from zoological families with living, fertile hybrids.

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Photoperiodic Induction of Senescence in Xanthium Plants

Abstract. Xanthium *plants placed under photoinductive conditions were accelerated in their senescence whether or not the plants had a capacity to produce flowers and fruits. Thus, the role of the mobilization influence of these organs on the senescence of certain monocarpic plants can be questioned.*

The rapid decline of vegetative growth and the dramatic onset of senescence in many annual plants have been attributed to the mobilizing influence of developing flowers and fruits (*1*). The inadequacy of this hypothesis to fully explain senescence in all monocarpic plants (those that form seeds once and die) has been shown in experiments with soybean (*2*), Alaska pea (*3*), and cotton (*4*), in which removal of flowers and fruits failed to prevent cessation of growth or to extend the life of the plants for more than a limited time. Further evidence against a simple mobilization basis of senescence is seen from studies on dioecious plants, for example, hemp (*5*) and spinach (*6*), in which the development of small staminate inflorescences is sufficient to induce senescence.

Although there is considerable evidence for the regulatory function of day length in controlling bud dormancy (*7, 8*) and leaf senescence (*7, 9*) in woody plants, the exact role of photoperiodic induction in the aging process of herbaceous plants has not been established, mainly because few investigators have studied senescence in photoperiodically sensitive species. Where these plants have been used, the influence of flower and fruit development generally has not been considered separately from that of photoinductive treatment alone.

Effects of flower and fruit development on senescence may be eliminated by using completely debudded plants, that is, those having both terminal and lateral buds removed. That the metabolic changes accompanying photoinduction may be similar in debudded and intact plants was shown by Vergara and McIlrath (*10*) in their studies on the influence of photoperiod on water-absorption by the short-day plant *Xanthium pensylvanicum.* Similar shifts in uptake of water were observed in both debudded and intact photoinduced plants even though the debudded plants never attained the developmental stages of synapsis, syngamy, and fruit development. These findings suggested that the effects of short-day treatment on the induction of senescence in debudded *Xanthium* plants should be explored.

Although our experiments are preliminary, the results obtained were reproducible and, therefore, provide further evidence that the death of certain annual plants is independent of the developmental events of flower and fruit production.

Experiments were carried out in the greenhouses at the University of Chicago. Burs of the Chicago strain of cocklebur (*Xanthium pensylvanicum* Wallr.) were soaked in tap water for 2 days in a wide-mouth bottle; the water was then displaced with oxygen and the bottle stoppered. After 24 hours the burs were planted in flats of vermiculite. When the seedlings had formed two true leaves, they were transplanted to 13-cm pots of fertile soil and placed on the greenhouse benches under a 20-hour (20H) noninductive photoperiod (consisting of 20 hours of light and 4 hours of darkness per 24-hour period). The plants were maintained in this environment for approximately 6 weeks.

Table 1. Effect of time of bud removal on senescence of *Xanthium* plants. 20H, noninductive photoperiod consisting of 20 hours of light and 4 hours of darkness in a 24-hour period; 9H, inductive photoperiod consisting of 9 hours of light followed by 15 hours of darkness.

Photoperiod	Mean days to death*	Range in days to death
Nondebudded		
20H	No death†	
9H	66.0	63 to 70
Debudded when photoperiodic treatment began		
20H	112.0	91 to 118
9H	64.7	63 to 66
Debudded 16 days later		
20H	130.6	118 to 139
9H	65.1	63 to 66

* Average number of days from start of photoperiodic treatment to death of the plant. Ten plants per treatment. † Nondebudded plants still alive after 365 days on 20-hour treatment.

Plants on the photoperiod trucks and greenhouse benches received 8 hours of natural light. Additional light to extend the photoperiod or interrupt the dark period was provided by 200-watt incandescent bulbs (providing approximately 1650 lu/m^2 at the level of the plants).

Plants were debudded by removing both terminal and lateral buds; the terminal buds were excised when the sixth leaf produced by the plants was at least 1 cm in length and the lateral ones were excised as soon as they were large enough to be successfully removed. The date on which all leaves on the main stem were completely dehydrated was recorded as the time of death of the plant. Ten plants were used per treatment.

In the first experiment, comparable sets of debudded and intact plants were either transferred to a continuous 9-hour (9H) inductive photoperiod (9 hours of light followed by 15 hours of darkness) or kept under continuous long-day (20H) conditions. Debudded photoinduced plants exhibited many of the same senile changes ob-

Table 2. Effect of night interruptions on senescence of debudded *Xanthium* plants. 9H, Inductive photoperiod consisting of 9 hours of light followed by 15 hours of darkness; 9I, 9-hour-interrupted noninductive photoperiod.

Photoperiod	Mean days to death*	Range in days to death
9H	57.3	56 to 61
9I	80.5	70 to 107

* Average number of days from start of photoperiodic treatment to death of the plant. Ten plants per treatment.

served in intact fruiting plants (that is, dehydration of the upper portion of the shoot and severe petiole epinasty at the time of fruit ripening, and basipetal pattern of necrosis of the entire shoot following bur maturation) even though they completely lacked the capacity to produce reproductive structures. Both intact and debudded plants were dead after 9 to 10 weeks of short-day treatment. Debudded plants that were kept under long-day conditions, however, took nearly twice as long to die (13 to 17 weeks); intact long-day plants were still alive and vegetative at this time.

To find out whether the time of death of the plant was determined by time of debudding or actual photoperiodic treatment, a second experiment was conducted in which the time of debudding was varied. Three sets of 42-day-old plants were placed under differential photoperiodic treatment (9H and 20H); one set was not debudded, another was debudded at the initiation of differential photoperiodic treatment, and the third set was debudded 16 days later. As before, plants given continuous photoinductive treatment (9H) died considerably sooner than those kept under continuous nonphotoinductive conditions (20H), regardless of the time of debudding (Table 1). In debudded plants receiving short-day treatment (9H), the mean number of days to death was nearly identical even though one group was debudded 16 days after the other. These results show that whether or not there was a difference in the production of a floral stimulus in plants debudded before and after the beginning of photoinductive treatment (*11*), there was no significant difference between treatments in the number of days to death. The fact that time of debudding had no effect on time of death of the photoinduced plants suggests that the metabolic consequences of photoperiodic induction were of greater importance in determining longevity in these plants than were the changes created by the removal of terminal and lateral buds. The time of death of plants exposed to long-day conditions, however, was influenced greatly by debudding and time of debudding. It is, therefore, quite apparent that bud removal had a significant effect on the longevity of these plants.

In order to establish whether the difference in time of death observed between debudded plants grown under a 20-hour photoperiod and those exposed to a 9-hour photoperiod was caused by a difference in total light energy (that is, total hours of illumination), an experiment was conducted in which long-day conditions were mimicked by using a 9-hour-interrupted (9I) noninductive photoperiod. This consisted of 8 hours of natural light plus a 1-hour light interruption midway through the dark period, since this is also the most effective time for preventing floral induction in *Xanthium* (*12, 13*). In both treatments the plants received a total of 9 hours of illumination (of equal energy value). Although most studies on flowering in *Xanthium* have utilized 16- to 20-hour photoperiods as control conditions (*13*), the advantage of minimizing possible differences in aging caused by differences of photosynthetic origin by using short-day and long-day conditions of the same duration seems obvious. As in previous experiments debudded plants exposed to long-day conditions (9I) died later than those given short-day treatment (9H) (Table 2).

More work must be carried out before the exact role of photoperiodic induction in plant senescence is established, but it is clear from these findings that the development of flowers and fruits is not the primary cause of death in certain short-day annuals. The feasibility of utilizing debudded plants and night-break conditions to investigate problems of aging in photoperiodically sensitive plants has been established, and this should allow a complete reexamination of the role of mobilization forces in plant senescence.

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Myristicin in Cigarette Smoke

Abstract. *The pharmacologically active aromatic ether, myristicin, was isolated from the smoke of commercial cigarettes. The compound was identified by spectrometry (infrared, ultraviolet, and mass) and gas chromatography. The amount of myristicin in smoke is relatively low, and its contribution, if any, to the physiological action of cigarette smoke is unknown.*

The presence of myristicin (5-allyl-2, 3-methylenedioxyphenyl methyl ether) in cigarette smoke has been demonstrated (*1*). This compound has biological activity and is believed to be responsible, at least in part, for the narcotic effect of nutmeg oil (*2*).

Myristicin was found in the fraction of the neutral substances soluble in nitromethane. This fraction was obtained from 1 kg of smoke condensate (equivalent to 50,000 cigarettes) by the separation procedure described (*3*). Chromatography on silicic acid of the components of the nitromethane soluble fraction yielded a fraction eluting with a mixture of *n*-hexane and benzene (1:1) which had an infrared