bovine tissues. The presence of the enzymes involved in lysine catabolism in bovine tissues suggest that lysine is catabolized via saccharopine pathway in bovine liver as well as in kidney. Our results indicate that the main catabolic pathway in the two species is similar. But the absence of KAT activity in bovine liver and kidney suggests that in bovine tissues, AadAT and KAT activities are not the properties of a single protein. Our results indicate that the transamination of kynurenine and hydroxykynurenine to kynurenic acid and xanthurenic acid does not occur in bovine tissues.

Tryptophan and its metabolites may be toxic when tryptophan is taken in higher doses as a sedative. Several cases of eosinophilia-myalgia associated with L-tryptophan have been reported[14]. Tryptophan also plays a role in some forms of cancers in which plasma levels and urinary excretion of tryptophan metabolites is increased[14-16]. This shows the interest for studies on tryptophan metabolism. Earlier studies of Kido[5] suggested that the transamination of kynurenine in the liver of monkey and human may be similar to that in the bovine liver. Further studies on the metabolism of tryptophan in bovine and other mammalian tissues may help to understand the role of tryptophan and its metabolites in various disorders.

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Phase-shift and memorization of the circadian rhythm of transpiration of *Tamarix aphylla*[1]

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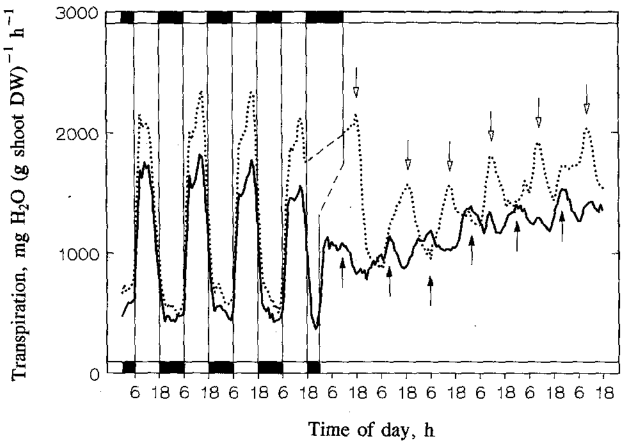
Summary. The control of the circadian rhythm of transpiration in *Tamarix aphylla* seems to include two distinct components: an externally induced one, that is initiated by the 'light on' signal, and an endogenous clock, whose memorization of the period length is independent of the instant environmental signal.
Key words. Circadian; rhythm; transpiration; clock.

Endogenous circadian rhythms with periods that range from 21 h to 28 h have been observed and reported for a variety of physiological and biochemical reactions of plants[2,3]. Regular oscillations of transpiration of *Tamarix aphylla* (L.) Karst. (Tamaricaceae) with high values during the days and low values during the nights were observed under field and under controlled environmental conditions[4,5]. Such oscillations have continued even after the plants have been transferred to continuous light, and were preserved under such conditions for at least 8 cycles. The mean period of the oscillations under such conditions was 21.7 h. When plants were moved after some time of training (12 h Light: 12 h Dark) to conditions of continuous darkness, no apparent rhythm of transpiration had developed, except for a minor increase in transpiration that was distinguished during the 'day' time of the first cycle. The question whether the observed circadian rhythm, in continuous light, was indeed under endogenous control, was tackled by the following phase-shifting investigation.

Plants of *Tamarix aphylla* were grown from cuttings under controlled environmental conditions (25 ± 2 °C; ca 70% RH; 12 h L: 12 h D cycles) in a modified 1/2 strength Hoagland's nutrient solution[4]. The plants were placed in 1-l containers with nutrient solution, the containers were sealed with plastic bags and the plants were placed on top of recording balances. The loss of weight, determined every hour, was used as a measure of the transpiration for each plant. At the end of the experiment, the rates of transpiration were calculated per dry



Time course of transpiration of two *Tamarix aphylla* plants. The light regimes of the respective plants are indicated by the bars above and below the curves. White bars: light; black bars: dark. 6 h darkness (——); 18 h darkness (·····). Peaks are indicated by arrows. Illumination: 50 µmol m^{-2} s^{-2}; Temperature: 26 ± 0.5 °C; Relative humidity: 66 ± 5%.

Timing of the peaks and length of the periods of the free-running oscillations of transpiration of *Tamarix aphylla* in continuous light.

Duration of last dark period	Peaks of transpiration (h after 'light on')						Mean period ± SD
	1	2	3	4	5	6	
6 h	10	33	53	73	95	117	21.4 ± 1.3
18 h	5	30	50	70	94	117	22.4 ± 2.3

weight of the plants' green shoots. The plants were entrained (12 h L : 12 h D) for 5 days. The last dark period, before the plants were transferred to continuous light, lasted 6 h for one treatment and 18 h for the other one. A free-running rhythm of transpiration was exhibited by both plants under continuous light (fig.). However, peaks and troughs, for each of the two pretreatments, occurred at different times of the real day, showing a phase shift. As the difference between the rhythms of the plants was 12 h of the last dark period, the subsequent oscillations were mirror-images. The plants varied somewhat in their absolute rates of transpiration, but the oscillations in their stomatal opening were well preserved (table). The peaks of transpiration in continuous light (Nos. 2–6 in the table) occurred, in both plants, at similar time intervals after the 'light on' signal. Thus, the timing of the peaks of the free-running cycles seems to be controlled by the time of the last inductive signal.

The periods of the oscillations under continuous light conditions were very similar for both treatments (table) and corresponded closely to those that we have described previously[4].

The presented data clearly show that in spite of the fact that the length of the period of the free-running rhythm is well memorized by the plants, initiation of the circadian cycle can be phase-shifted by different night lengths. This is a typical feature of an endogenous circadian rhythm[3,6,8]. The clock mechanism that controls the rhythmic transpiration is reset by the 'light on' signal, and by that determines the beginning of the subsequent free-running cycles. The nature of the clock itself remains obscure.

Preservation of such a rhythm seems to be of ecological significance by enabling the plants of *Tamarix,* which grow in hot desert environments, to open their stomata just at daybreak, i.e., during the cool and humid morning hours, in order to acquire enough CO_2 without great transpirational losses of water[4,7]. Such a rhythm also induces an early closure of the stomata in the afternoon, and thus further reduces the water loss by such plants.

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