Table 2. SUCCESSIVE TRANSMISSIONS AFTER RECEIPT OF THE STRAIN ON NOVEMBER 14, 1962: MOUSE 931

Date	No. of passage	Animal	Observations
14/11/62–20/11/62	1–2	Young mice	Weekly transmissions
27/11/62–4/1/63	3–7	*Thamnomys*	Weekly transmissions
2/1/63–20/9/63	8–41	Young mice	Weekly transmissions
27/9/63	42	Albino rat 362	Blood in deep freeze on 10th day after inoculation. Kept at low temperature for 414 days (8/10/63–26/11/64)
26/11/64	43	Young mouse	
3/12/64–11/12/64	44–45	Albino rat	Weekly transmissions
18/12/64–29/5/65	46–68	Young mice	Weekly transmissions
28/5/65	69	Young mouse	Few exflagellations observed in the blood on 3/6/65, 6 days after inoculation

We observed also exflagellation in the transfers originating from mouse 931 (Table 2). This animal was also infected with *P. vinckei* blood originating from rat 362, but the infected blood was kept for 414 days at −75° C and afterwards passed in successive transfers to mice. Exflagellation of microgametocytes in small numbers was observed at the 69th blood transfer. In the five observations in which exflagellation was hitherto observed, all were made on the sixth and seventh days after inoculation.

It may, therefore, be concluded (or at least assumed) that in *P. vinckei*, as in *P. berghei*, a period of 'quiescence' at low temperature (−75° C) favours the later re-appearance of viable gametocytes. This phenomenon, however, must be confirmed by further observations as it conflicts with investigations made in human malaria in which gametogony is present in acute cases of malaria. However, it is important that more attention should now be given to the possibility of transmission of infection by asymptomatic cases.

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Phosphorus-deficiency Symptoms in Tobacco and Transpirational Water Loss

PHOSPHORUS-DEFICIENCY symptoms have been described for tobacco[1] and have been duplicated here in solution culture with the 'Virginia Gold' variety. The symptoms, however, do not develop until a weather condition permits a high rate of transpiration. It is under this condition that the spotting and scorching of the lower leaves of tobacco plants occur. Until there was a stress there were no visual symptoms present.

The water loss per unit of leaf area from plants to which no phosphorus was added was about twice as great for phosphorus-sufficient plants as for the phosphorus-deficient plants (Table 1). The kerosene spot test indicated that the stomata of most of the lower leaves of phosphorus-deficient plants not having any visual symptoms were closed when stomata of phosphorus-sufficient plants were fully open. Stomata on leaves on top of the plant were open in either case. The reason for this latter effect is that phosphorus in deficient plants is retranslocated to new growth. Hence, the low water use of the phosphorus-deficient plants was related to the failure of stomata to open. When the top third of both kinds of plants was cut off, the differential transpirational water loss per unit area was about 2·5–3 times greater for the phosphorus-sufficient plants.

The classical explanation for regulation of stomatal opening is a photosynthetic decrease of carbon dioxide in the guard cell, which decreases *p*H. This in turn stimulates amylase which converts starch to sugar, which leads to an increase in osmotic pressure which results in opening of the stomata[2]. More recently, the metabolism of glycolic acid has been implicated[3]. Oxidative phosphorylation seems to be associated in some manner, in that appropriate inhibitors prevented stomatal opening[3].

Table 1. YIELDS, WATER LOSS, AND PHOSPHORUS CONTENTS OF PLANTS

Measurements	No phosphorus	0·003 *M* phosphorus
	Whole plants	
Dry wt. of tops (g)	24·3	70·5
Dry wt. of roots (g)	5·0	5·6
Leaf area (cm²)	5,570	13,300
Water loss in 6 days per cm² leaf (ml.)	0·50	0·91
Water loss in 6 days per g root (ml.)	560	2,160
P in top leaves (% dry wt.)	0·17	0·71
P in middle leaves (% dry wt.)	0·07	0·82
P in bottom leaves (spotted and scorched without P) (% dry wt.)	0·07	0·65
	Plants with tops removed	
Water loss in 6 days per cm² leaf (ml.)	0·30	0·80
Water loss in 6 days per g root (ml.)	290	791

The role of phosphorus in metabolism is so pronounced that it is quite understandable that phosphorus deficiency can upset the functions of guard cells. The interesting point is that the reactions in guard cells are more sensitive to phosphorus deficiency than many other plant reactions in that the plants continued to grow under the conditions of the experiments. It can thus be expected that the phosphorus nutrition of at least this one plant species can regulate to a certain extent its water relations.

An intriguing question relates to the function of transpiration. In tobacco, injury occurred when transpiration could not proceed at the usual rate. This was very pronounced where the kerosene had been applied to the leaves. In phosphorus-sufficient plants the kerosene entered the stomata and there was no subsequent injury. In the phosphorus-deficient plants, the kerosene did not penetrate but formed a layer on the leaves and evidently decreased even more the exchange of gases between the leaf and atmosphere. These kerosene spots developed the usual phosphorus-deficient leaf spots for this species. The logical inference is that transpiration, or at least open stomata, serves a beneficial role. It could be that of regulating the temperature of the leaf, although the loss of a toxic volatile compound through open stomata may offer a better explanation of all the results.

The phosphorus deficiency in this plant species resulted in decreased yield of tops but in little decrease for that of roots (Table 1). This behaviour is observed for nitrogen[4] but has not been reported for phosphorus. The volume of water transpired per gram of roots was about three times as high for the phosphorus-sufficient plants as for the phosphorus-deficient plants (Table 1).

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