The results of this work, given in Table 1, show that all the metaphases in the PHA culture were labelled, while most of the metaphases in the *YAF* culture were unlabelled. In the *YAF* plus PHA culture nearly all the metaphases were labelled (94 per cent).

The 100 per cent labelling of metaphases in the PHA culture confirms a previous report[6] and indicates that PHA sensitive cells are in the pre-DNA synthetic period (*G*1) prior to culture. The fact that most of the metaphases were unlabelled in the *YAF* culture suggests that most of the *YAF* sensitive cells are in a post-DNA synthetic period (*G*2) prior to culture. Since most of the metaphases in the *YAF* plus PHA culture were labelled and many heavily so, it would seem that inhibition of uptake and incorporation of thymidine by *YAF* is not responsible for the many unlabelled metaphases in the *YAF* culture.

Rather our results seem to indicate that the majority of the cells stimulated by *YAF* to divide have already undergone DNA replication before the initiation of the cultures, and that a small portion (lightly labelled) are apparently terminating DNA replication when the culture is started. Several authors have reported the existence of a small fraction of nucleated blood cells which undergo DNA replication while in circulation[7,8]. However, under physiological conditions, no mitotic figures are observed in peripheral blood smears. Although the frequency of the cells in active DNA synthesis varies considerably in the different reports (0·06–0·5 per cent), it is generally higher than the frequency of mitotic figures observed in cultures initiated without the addition of any agent.

It appears, then, that the circulating leucocytes consist of at least three populations with respect to their ability to complete cell division *in vitro*: (1) a major population of cells that are in their *G*1 phase and are stimulated to divide by PHA; (2) a minor population of cells that are in *G*2 and are stimulated to divide by *YAF*; and (3) a very small population of cells which are able to divide spontaneously.

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SOIL SCIENCE

Influence of Nitrogen on the Availability of Fertilizer Phosphorus

THE beneficial effects of additions of nitrogen on the availability of fertilizer phosphorus have been investigated with various techniques, such as when nitrogen is mixed with the soil and phosphate added as placement, when both nitrogen and phosphate are added separately or when nitrogen and phosphate are added in intimate association. With the view of investigating the influence of nitrogen on the availability of fertilizer phosphorus, under conditions of both nutrient sources being mixed with the soil, work described here was carried out on two soils (important characteristics given in Table 1) using wheat as a test-crop through greenhouse pot-culture experiments, involving the use of radiotracer techniques.

Table 1. MAIN CHARACTERISTICS OF SOILS

No. Soil	*p*H (1 : 2·5 ratio)	% organic N (Kjeldahl's method)	Available P_2O_5 (lb./acre Olsen's method)*	% free $CaCO_3$ (Collins calcimeter)	Cation exchange capacity (m.equiv./ 100 g)
I Alluvial soil I.A.R.I., N. Delhi	7·8	0·07	37·0	0·69	10·21
II Alluvial soil Sabour (Bihar)	6·2	0·08	10·0	Traces	5·22

* *U.S. Dept. Agric. Circ.* No. 939.

Table 2. INFLUENCE OF UREA ON THE AVAILABILITY OF PHOSPHORUS FROM SUPERPHOSPHATE

Treatment	Soil I Total P (mg/ pot)	Soil I % uptake	Soil I Fert. P (mg/ pot)	Soil I % utilization	Soil II Total P (mg/ pot)	Soil II % uptake	Soil II Fert. P (mg/ pot)	Soil II % utilization
Control	3·30	—	—	—	1·88	—	—	—
P	3·56	49·43	1·74	8·89	3·78	56·65	2·15	10·87
N_1 + P	5·21	48·02	2·74	13·82	3·91	62·27	2·35	11·89
N_2 + P	5·32	63·05	3·48	17·06	4·32	64·68	2·40	12·12
S.E.M.*	0·30	2·22	0·24	1·19	0·23	1·87	—	—
L.S.D.† at 5% level	0·87	6·84	0·73	3·65	0·68	5·76	N.S.	N.S.

P, 40 lb. P_2O_5/acre as super: N_1 and N_2, 40 and 80 lb. N/acre as urea respectively.
* S.E.M., standard error of mean.
† L.S.D., least significant difference.

Three levels of nitrogen (0, 40 and 80 lb. N/acre) as urea were combined with two levels of phosphate (0, 40 lb. P_2O_5/acre) as superphosphate in a randomized design, and each treatment was replicated thrice. Superphosphate was tagged with phosphorus-32. The nutrient sources were mixed with the soil in an electrically operated twin-shell dry blender.

Dried composite samples consisting of three plants from each replicate were wet-ashed and analysed for phosphorus[1]. Radioactive phosphorus was determined by the method of Meckenzie and Dean[2].

In soil No. 1, the supplementary application of nitrogen as urea significantly increased the absorption of total phosphorus by wheat plants when compared with that due to phosphate application alone. Here the application of nitrogen significantly enhanced the amount of phosphorus in plants derived from the fertilizer source. In this soil, percentage utilization of applied phosphorus has also been found stimulated due to the presence of nitrogen along with the source of phosphorus. Table 2 shows that higher doses of urea significantly increased percentage uptake of fertilizer phosphorus in both the soils under examination.

Olson and Dreier[3] have shown the importance of association between nitrogen and phosphate sources in causing increased uptake of fertilizer phosphorus when applied in intimate association. Rennie and Soper[4] also found increased utilization of fertilizer phosphorus only when nitrogen was intimately associated with phosphate fertilizer.

It must be realized in the investigation recorded here that both nitrogen and phosphorus were homogeneously mixed with the soil and under these conditions the effect of nitrogen on the utilization and uptake of fertilizer phosphorus is revealed. In such cases, as here, the association between nitrogen and phosphate had definitely been maintained though to a lesser degree as compared with that in a band. Probably this association between nitrogen and phosphorus may be partly responsible for increasing the availability of fertilizer phosphorus to plants in such systems also.

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