occurrence of some erect types in successive generations; however, the mutant studied here was true breeding in successive generations and the instability of the expression of this character has not been observed. The prostrate habit of the mutant observed by Pavithran from Norin 18, a *japonica* type, was recessive in nature but he observed the interaction of three genes in the cross with a ratio 54 : 10.

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PLANT ANALYSIS FOR NITROGEN IN MAXIMISING WHEAT YIELD

THE interest in plant analysis for diagnosing nutrient deficiencies is largely because of its use as a supplementary tool in soil testing. Plant composition provides reliable information about the pattern of nutrient absorption by plants and therefore, in standardisation of foliar analysis, the nutrient content of different plant portions at certain growth stages have been correlated with crop yield or physical appearance of the plant. In the work on standardisation of plant analysis, the major problem lies in the selection of appropriate sample with special reference to the choice of right plant part and proper plant growth stage.

Wheat cultivation is of great importance in India. Though the changes in N content of wheat plant due to applied fertilisers have been studied greatly in this country, yet not much emphasis has been given to the standardisation of foliar analysis. Venkateswarlu[1] quoted the unpublished work of Murthy that for foliar analysis in wheat, the appropriate sample is represented by third and fourth leaf from top, 4 to 8 weeks after seeding. In order to establish the critical level of N concentration in wheat plant for fertiliser use, the present study was undertaken. This paper reports the suitability of plant part and appropriate growth stage for plant analysis.

For this study, plant samples were collected from field experiments conducted at Punjab Agricultural University Farm, Ludhiana, under 'Soil Test Crop Response Correlation Scheme' with wheat (variety WL-711). The experimental field represented arid brown soil and sandy loam in texture, alkaline in nature (pH 8·5) and showed no salinity problem (E.C. 0·20 mmhos/cm).

The field had been divided into four strips, each strip receiving different N, P and K treatments to obtain 4 different fertility gradients. The available nutrient status of these strips is given in Table I. The experimestal

TABLE I

Available nutrients status of soils (kg/ha) in different fertility gradient strips

Treatment in fertility gradient strip	Available N	Olsen's P	NH_4OAC-K
$F_0P_0K_0$	69	8·4	97
$F_{\frac{1}{2}}P_{\frac{1}{2}}K_{\frac{1}{2}}$	85	19·2	137
$F_1P_1K_1$	94	23·5	230
$F_2P_2K_2$	104	34·0	338

F_1, P_1, K_1 represent 20 tons FYM, 240 kg P_2O_5 and 300 kg K_2O per hectare.

crop in each strip, received 21 selected combinations of N, P and K in addition to 6 control plots. The plant samples (leaves) were collected from selected plots representing graded levels of applied N (0, 50, 100, 150 kg N/ha) from each strip at three growth stages *viz.*, maximum tillering stage, late jointing stage and heading stage. At each stage, samples representing young leaf (3rd and 4th from top) and old leaf (6th and 7th from top) were collected during the morning hours. In addition, the flag-leaf sample at heading stage was also included. The leaf samples were washed with distilled water, dried at 60 ± 1° C and ground in a stainless steel blender and analysed for total N by Kjeldahl's method.

Application of N significantly increased the wheat grain yield which varied from 20·2 q/ha in the control to 44·0 q/ha with application of 150 kg N/ha (Fig. 1). Considering the criterion proposed by Martin and Matocha[2] that 90% of the maximum yield represents optimum, in this study, N level of 100 kg/ha was found to be the optimum.

The changes in N concentration in the young leaf (3rd and 4th) at tillering and heading stages and in flag-leaf at heading stage as affected by N application are shown in Fig. 1. It is seen that the concentration of N in the leaf samples increased with application of N. At the optimum N dose of 100 kg/ha, the critical N level in leaves (3rd and 4th) was found to be 4·53% at maximum tillering stage, 2·70% at heading stage and 2·85% in the flag-leaf at heading stage.

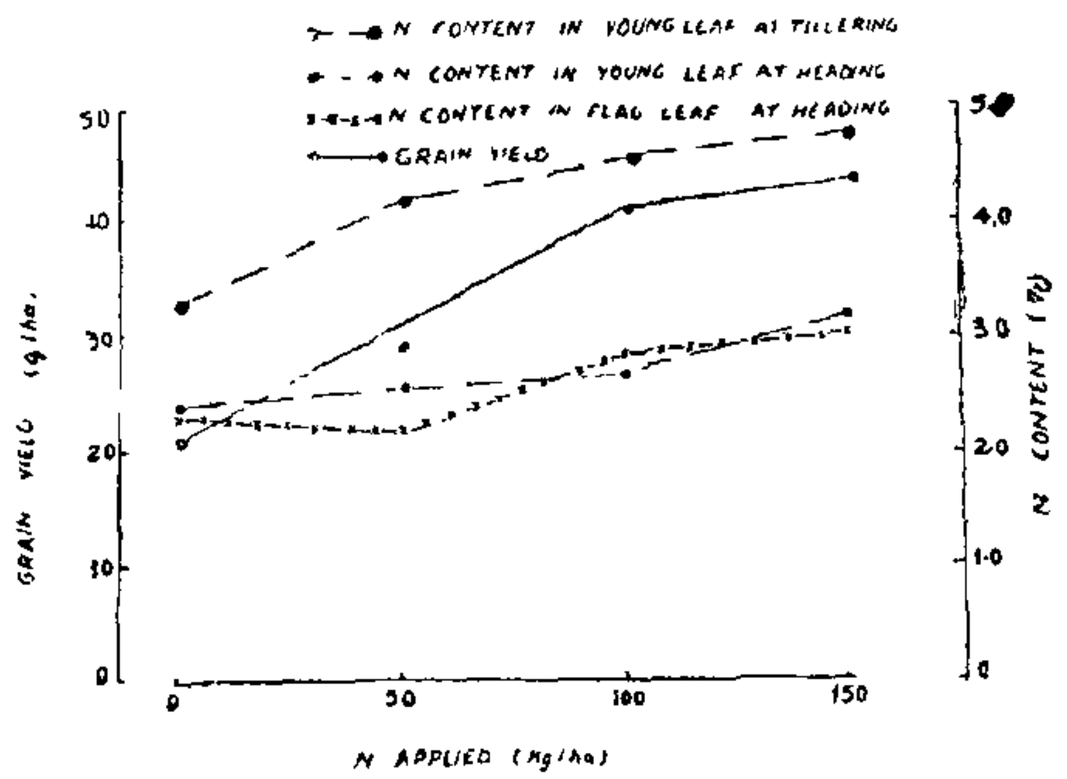

FIG. 1. Effect of N application on grain yield and N content in leaf samples at different growth stages.

The per cent N in young leaf representing 3rd and 4th leaf from top at the maximum tillering stage and heading stage and in the flag-leaf at heading stage gave highly significant correlation with wheat grain yield (Table II). It is therefore evident that in leaf analysis for N, sampling can be satisfactorily done both at maximum tillering as well as at heading stage. In this, young leaf represented a proper sample at maximum tillering and at heading stage, and flag-leaf at heading provided a suitable sample. These results suggest that for practical farming practices, sampling of 3rd and 4th leaf of wheat plant, at maximum tillering for N analysis may be preferred since it will allow adoption of N fertilization to correct the deficiency, at this early stage. It may be mentioned that when the foliage sample is collected at later growth stage, the results are of relatively less practical importnace, since corrective measures at later stage of plant growth may not be of much use, as N is required by the plants during the early vegetative growth.

TABLE II

Correlation coefficients between N concentration in wheat leaf at different plant growth stages and grain yield

Plant Part	Growth Stage		
	Maximum tillering	Late jointing	Heading
Young leaf	0·61*	0·30	0·67*
Old leaf	0·02	−0·41	0·01
Flag-leaf	..	..	0·70*

* Significant at 1% level.

Effect of growth stage on N concentration in leaf :

The N concentration in foliage sample (averaged over N levels applied) at different growth stages are shown in Fig. 2. It is seen that the young leaf (3rd and 4th) contained more N as compared to the old ones (6th and 7th) at all growth stages Further, with advance in growth stage, N concentration in the leaves declined sharply. The N concentration at heading stage over maximum tillering stage was reduced to about 65% in the young leaf and to 30% in the old leaf.

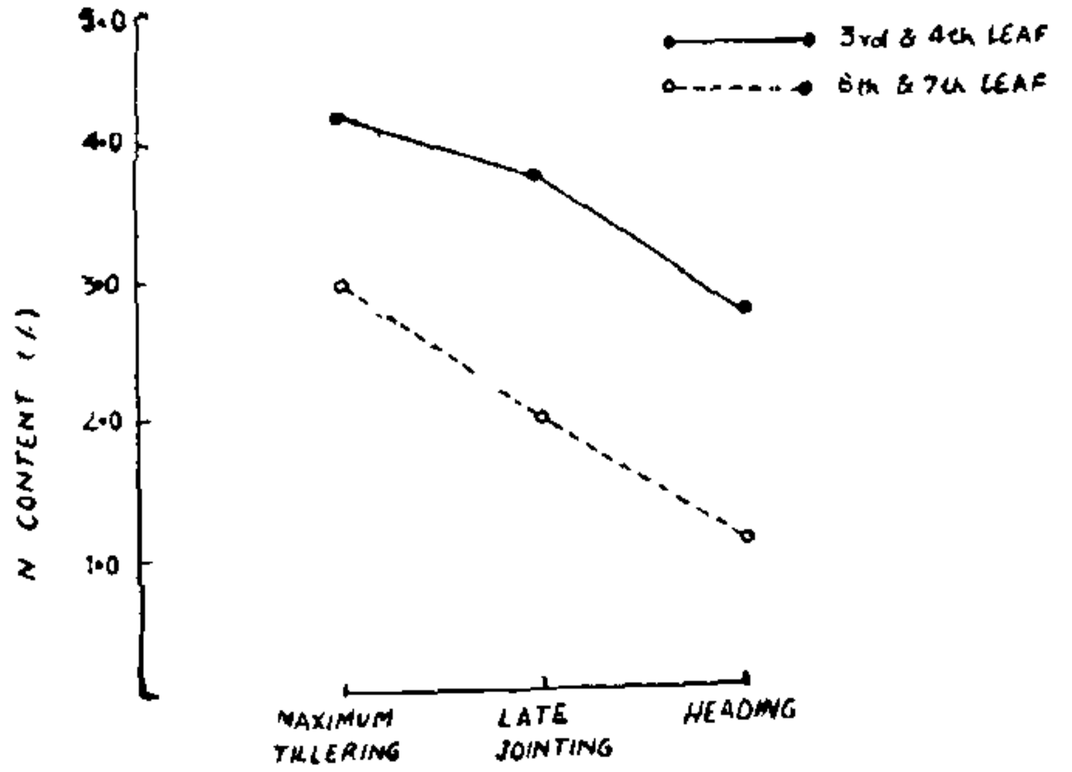

FIG. 2. N concentration in different leaf samples at various plant growth stages.

These results are in conformity with the findings of Schrenk[3] and Bootright and Haas[4] who found that N content in different above-ground plant parts of wheat declined sharply between tillering and heading. Single[5] suggested that since the response of wheat to N decreased as the plant development progressed, for N nutrition, the foliar sampling period before spikelet initiation was particularly important. However, Olson and Koehler while reviewing the literature on elemental changes in wheat plant with crop growth support the need of sampling at heading stage. Chapman and Kaay[7] found that after head-emergence, there was no significant effect of fertilizers on wheat yield, emphasising the importance of adequate nutrition of wheat plants at *early* growth stages. The results of our studies showed that in wheat, sampling of young leaf (3rd and 4th) or flag-leaf at stages earlier to head-emergence satisfactorily reveals N inadequacies and the critical level varies with the sample.

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A NEW SPECIES OF *PSEUDOCERCOSPORA*

DURING a survey of fungi from Gorakhpur region, authors collected a leaf spotting fungus on *Gymnema tingens* W. and A. This fungus was found to be a *Pseudocercospora*. A comparison of this fungus with certain known species (Ellis[1,2]; Deighton[3]), is given in Table I.

TABLE I

Name of the species	Conidiophores		Conidia		
	Size (in μm)	Structure	Size (in μm)	Color	Septation
P. vitis	upto 500 × 2–7	unbranched	35–95 × 6–8	..	5–14
P. helleri	upto 400 × 3–6	branched	20–35 × 6–10	Pale olivaceous	2–5
P. terminaliae	upto 100 × 5–10	unbranched	50–115 × 7–9	Pale to midbrown	2–9
P. pterocauli	upto 150 × 3–5	branched	20–75 × 4–7	Pale brown	1–8
P. gymnematis (Present sp.)	upto 70 × 2·8–4	unbranched	16·5–60·5 × 2·5–4·3	Subhyaline	Multiseptate

A perusal of the morphological features of the *Pseudocercospora* spp. presented in the table suggests the distinct specific identity of the present collection. This taxon is neither conspecific with the known species nor any species of *Pseudocercospora* that has ever been described on the host in question. The present fungus, therefore, merits description as a new species. The descriptions and illustrations of this new taxon are as follows :

Pseudocercospora gymnematis sp. nov.

Contagionis maculae maximam parteum hypophyllae, rotundatae vel ovales, saepe effusae, brunneae vel sature brunneae; mycelium e hyphis immersis, hyalinis, septatis, levibus, ramosis compositum; stroma valide evolutum, sature brunneum, subglobosum vel angulare, conidiophori, macronemati, mononemati, plus minusve faciculati, pallide vel olivaceo-brunnei plerumque flexuosi, erecti, septati, leves, haud ramosi, divergentes, geniculati, in apicem nonnihil expansum inflati, denticulis conidiogenis praediti, ad 70 × 2·8 —4 μm; cellulae conidiogenae integratae, terminales, juvenes crebre monoblasticae et percurpentes, maturiores polyblasticae, sympodiales, denticulatae denticulis brevibus, amplis, cicatricibus conidicis nullis; conidia singularia, acrogena vel acropleurogena, simplicia, sub-hyalina, levia, obclavata, ad basim conico-truncata, apice subacuto, recta vel paulum arcuata, transverse multi spetata, ad septa parum constricta, 16·5–60·5 × 2·5–4·3 μm. (Fig. 1*a*, *b*).

In foliis vivis *Gymnematis tingentis* W. and A. (Asclepiadacearum) Gorakhpur m. januario 1978 leg. P. Kumar 2, IMI 229183, typum.

Infection spots predominantly hypophyllous, circular to oval, often effuse, brown to dark brown; mycelium of hyphae immersed, hyaline, septate, smooth, branched, stroma well developed, dark brown, subglobose to angular; conidiophores macronematous, mononematous, more or less fasciculate, pale brown to olivaceous brown, usually flexuous, erect, septate, smooth, unbranched, divergent, geniculate, blowing out in somewhat swollen apex, with conidial denricles, upto 70 × 2·8–4 μm; conidiogenous cells integrated, terminal, often monoblastic and percurrent in young conidiophores, later polyblastic, sympodial, denticulate with short and broad denticles, with no conidial scars; conidia solitary, acrogenous to acropleurogenous, simple, subhyaline, smooth walled, obclavate, conico-truncate at base, apex slightly acute, straight to