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***Short Communication***

# Variability of solar, net and photosynthetically active radiations in wheat *(Triticum aestivum L.)* canopy

**ABDUS SATTAR* AND R. P. TRIPATHI**
Dept. of Soil Science and Agrometeorology, G.B.P.U.A. & T, Pantnagar - 263 145

Radiation umbrella atop the crop canopy and the spatial and temporal variability of radiation within the canopy constitute a crop's basic resource environment. Baldocchhi *et al.* (1985) concluded that in soyabean leaf width did not affect the above- canopy radiation balance but the net radiation profile was greatly modified within the canopy. At maximum leaf area index (LAI = 5.83), wheat crop intercepted about 91 to 94 per cent of the photosynthetically active radiation (PAR) (Chahal *et al.,* 1994). At high LAI, the per cent interception was large and independent of quality of incident radiation. (Hipps *et al.,* 1983). Prasad and Sastri (1994) stated that interception of PAR was maximum (78 to 90 per cent) towards the end of the tillering stage of the wheat crop. The objective of this study was to assess the variability of solar, net and photosynthetycally active radiations within wheat crop canopy.

A field experiment with wheat (*Triticum aestivum* L.) variety UP 2338 was conducted in patharchhata sandy loam soil at Pantnagar. The crop was sown on 18[th] November, 1998 in an east-west direction, well fertilized and irrigated. Solar radiation was measured by Kipp and Zonen thermopile pyranometer at 0.175 and 1.25m height from the soil surface in the experiment field from the late jointing stage. The net radiation (Rn) was measured at hourly intervals at canopy level and at 50 per cent of crop height using net radiometer with integrator. The PAR was measured at 0.12m from the soil surface, middle and top of the crop canopy using silicon sensor of the steady state porometer. Measurements were made at hourly intervals throughout the observation day. Interception of PAR (IPAR) was calculated as

$$\text{IPAR} = \frac{(\text{PAR})_{TC} - (\text{PAR})_{H}}{(\text{PAR})_{TC}} \times 100$$

$(\text{PAR})_{TC}$ = PAR at top of the canopy.

$(\text{PAR})_{H}$ = PAR at desired height of the canopy .

Leaf area index (LAI) and plant height were measured on all observation days.

Solar radiation receipts beneath the wheat canopy depended on LAI, canopy density, plant height and on the nature of the observation day. The ratios of transmitted radiation ($R_T$) to radiation incident on canopy showed proportionately low values during 90-119 days after sowing (DAS) ( Table 1). This period represented maximum foliage density of the crop ( maximum LAI = 6.3). Net radiation (Rn) was higher at post anthesis stage than that during the vegetative phase.

The relationship between the ratio of total net radiation (daily sum of hourly values of net radiation) at mid canopy and at the top of

* Present address : Agromet Services, Dept. of Agronomy, RAU, Pusa - 848 125 (Bihar)

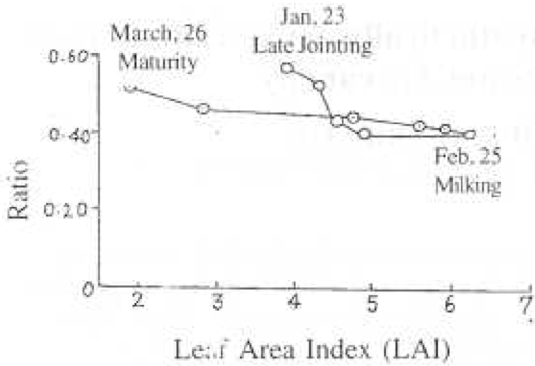


**Fig. 1 :** The ratio of net radiations ($R_n$) at mid canopy level to that at top canopy as a function of leaf area index (LAI).

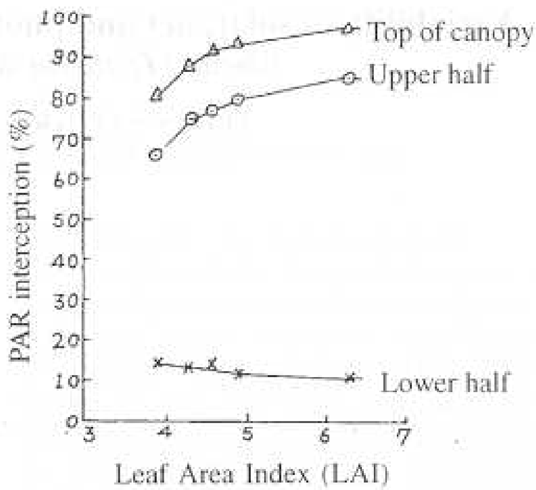


**Fig. 2 :** PAR interception (%) at defferent canopy layers in wheat.

**Table 1:** Ratio of transmitted ($R_T$), net (Rn) and PAR with radiation incident (Rs) on wheat canopy.

| Ratio | Days after sowing (DAS) | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | 66 | 73 | 80 | 90 | 99 | 108 | 111 | 119 | 126 | 128 | 134 |
| $R_T/R_s$ | - | - | 0.35 | 0.24 | 0.28 | 0.21 | 0.19 | 0.19 | 0.23 | 0.25 | 0.30 |
| $R_n/R_s$ | 0.75 | 0.73 | 0.59 | 0.72 | 0.71 | 0.70 | 0.73 | 0.80 | 0.84 | 0.83 | 0.81 |
| $PAR/R_s$ | 0.57 | 0.59 | 0.56 | 0.56 | 0.53 | 0.53 | 0.52 | 0.51 | 0.50 | - | 0.49 |

canopy level and LAI showed that ratio decreased upto maximum LAI (6.3) and then increased until maturation of the crop (Fig. 1). The proportion of Rn at mid canopy decreased as LAI increased. Thus higher LAI increased greater attenuation of Rn at mid canopy.

The percent interception of PAR calculated over entire canopy column from top of the canopy down to 0.12m above the soil surface was associated with plant height and LAI. At maximum LAI (Figs. 1 & 2), near the milking stage, the interception was 97.5 per cent. As LAI increased from 4.0 at late jointing to 6.3 at milking stage, PAR interception increased at the upper half and top level of the canopy.

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Chahal, J.S., Kler, D.S. and Singh, S. 1994. Relationship between leaf area index (LAI) and the distribution pattern of photosynthetically active radiation (PAR) in the profile of wheat canopy. *Crop Res.*, 7 (3) : 343-346.

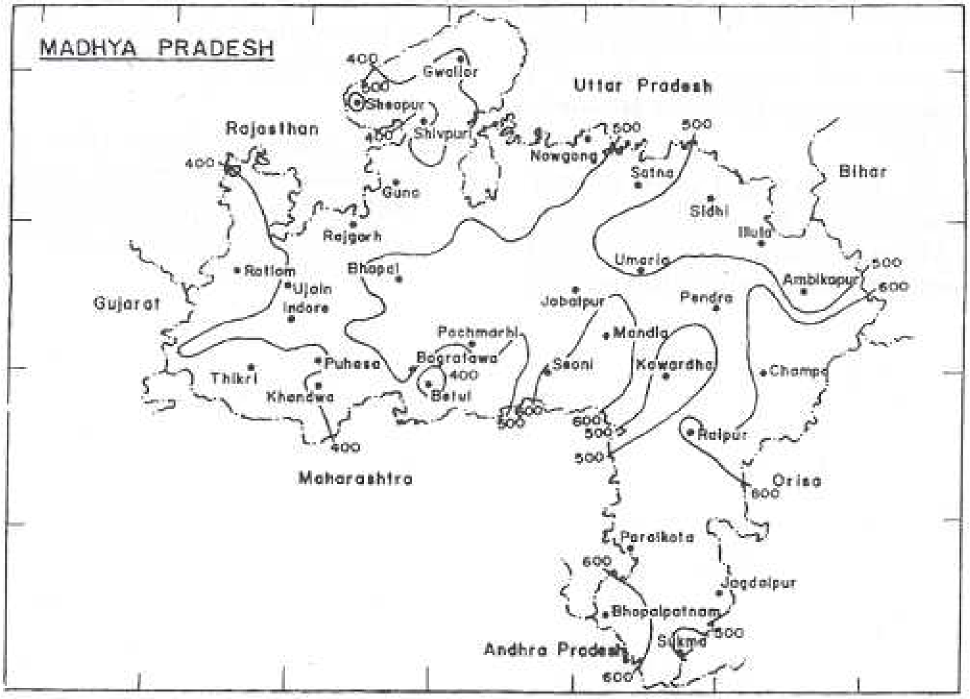
Hipps, L.E., Asrar, G. and Kanemasu, E.T. 1983. Assessing the interception of photosynthetically active radiation in winter wheat. *Agric. Meteorol.*,28:253-259.

Prasad, R. and Sastri, C.V.S. 1994. A study on radiation interception, albedo, net radiation crop growth and yield in wheat (*Triticum aestivum* L.). *Indian J. Ecol.*, 21 (2) : 113-116.

# ERRATA

**(Volume 2, Number 2, December 2000)**

Page No. 107 : Fig. 1 : Iso - erodent map of Madhya Pradesh on annual basis. The correct figure is given below.




Page No. 113 : Read the title as **"Use of CERES-Wheat model for predicting wheat yields of Nainital district (U.P.), India"** instead of "Use of CERES-Wheat model for predicting wheat yields of Ninital district (U.P.), India"

Page No. 115 : Table 1 : Read **"1 °C"** instead of "10 °C" in the description of genetic parameter P5.

Page No. 116 : Description in equation 2 and text (line 24). Read **"when year ≤ 1987"** instead of "when year = 1987".

Page No. 117 : In text (line 12). Read **"YDSIM"** instead of "♀ DSIM"

Page No. 118 : Fig. 1 : Read the legend as **"*Consistent yield series of Nainital district"** instead of "*Consistent yield series of Nainital Districted*".

Fig. 4. : Read the legend as **"Comparison between observed and predicted yields. Yields from 1980 to 1994 are fitted, while yields from 1995 to 1998 are predicted"** instead of "Relationship between observed yield deviations (YDOBS) from trend and simulated yield deviations (YDSIM) from trend".