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Variation of relative humidity and air temperature in rice (*oryza sativa* L.) canopy

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ABSTACT

A field experiment was conducted at Regional Agricultural Research Station, Jagtial (18°50' N, 78°56' E; 248.4 m above MSL) during *kharif,* 2005 and *rabi* 2005-06 to study the micro climate variation, particularly relative humidity and air temperature in rice crop canopy. Higher relative humidity was recorded within crop canopy at flowering stage than at panicle initiation and dough stage in both the seasons. During *kharif* higher relative humidity was recorded compared to *rabi* season. Higher relative humidity and air temperatures were recorded within crop canopy than above crop canopy.

Keywords: Rice, relative humidity and air temperature

In Andhra Pradesh, rice is being cultivated in an area of 4 million ha, of which 95 per cent is under irrigation. To improve production, it is imperative to understand the weather both at macro and micro level as weather directly influences the crop growth and development. For higher productivity, rice requires higher light intensity. Temperature and relative humidity within the crop canopy vary as the crop grows. Atmospheric humidity influences the internal water potential of plants and the rate at which plants transpire water into atmosphere (Hoffman, 1973). Most of the rice is cultivated under irrigated ecosystem. In this system, 2-5 cm depth of water is maintained during the crop period that changes the microclimate of the crop. There is a need to know the microclimate variations particularly relative humidity and temperature in rice crop for optimum crop production. Hence, the present investigation was undertaken to study the relative humidity and air temperature profiles in rice crop during day time.

MATERIALS AND METHODS

A field experiment was carried out during *kharif*, 2005 and *rabi* 2005-06 with rice *Cv*. Jagtiala Sannalu by adopting 15cm X 15cm spacing with a plot size of 12m X 9m at Regional Agricultural Research Station, Jagtial, Andhra Pradesh. The co-ordinates of the study site are 18°50' N latitude and 78°56' E longitude with an altitude of 248.4 m above MSL. The weekly meteorological data pertaining to *kharif*, 2005 and *Rabi*, 2005-06 were presented in Table 1 & 2. The *kharif* crop was sown on 04.07.2005 and harvested on 14.11.2005.

Rabi crop was sown on 07.12.2005 and harvested on 04.05.2006. All the recommended cultural operations and protection measures were adopted.

The relative humidity and temperatures were measured within crop canopy (*i.e.*, 10 cm height from ground level) and above crop canopy (*i.e.*, 10 cm height from above crop canopy) using instrument 'Kesrtel Pocket Weather Tracker' (Mfd. by Nielsen-Kellerman, USA) at fortnightly interval from 9.00 h to 16.00 h IST during both the seasons. The weather tracker gives instantaneous readings and three readings were recorded each time and averaged for interpretation.

RESULTS AND DISCUSSION

Temporal and seasonal variation in RH

The study revealed that, daytime relative humidity decreased gradually from 9.00 hrs to 15.00 hrs within crop canopy with slight increase of 2-4% by 16.00 h. Roy and Tripathi (2006) also observed similar results in wheat crop. Similar trend in relative humidity was also observed above crop canopy. Higher relative humidity (up to 8%) was recorded within crop canopy than above crop canopy during both the seasons. During *kharif* and *rabi,* higher relative humidity was recorded within crop canopy at flowering stage than at PI stage and dough stage (Table 3).

Higher relative humidity was recorded in *kharif* than in *rabi* crop. During *kharif* the relative humidity within crop canopy at 09.00 h ranged from 57-85% (Table 3) and in *rabi* it was 49 – 65% (Table. 4). Whereas, the relative humidity above crop canopy in *kharif* was in the range of 50-82% and in *rabi* it was 46-60%. Higher variations were observed in a day during the *kharif* than in *rabi.*

The rice grain yield was higher during *rabi* season (5.30 t ha^{-1}) compared to *kharif* season (5.14 t ha^{-1}). This was due to the availability of relatively more number of sunshine hours during *rabi* season compared to *kharif* (Table 1 & 2).

Temporal and seasonal variation in air temperature

Sometimes sudden fall in air temperature was observed during the day time due to the passage of cloud while recording observations. Higher air temperature was recorded within crop canopy than above crop canopy and it was in the range of 0.1 to 2.0 °C.

Higher air temperature was recorded within and above crop canopy during early stages of the kharif crop and decreased with advance of the crop growth. Whereas, in *rabi* with the advance of crop growth higher air temperatures were recorded.

CONCLUSIONS

It can be concluded that, higher relative humidity was recorded within crop canopy at flowering stage than at panicle initiation and dough stage in both the seasons. During *kharif* higher relative

Table 1: Weekly meteorological data recorded at RARS, Jagtial during *kharif*, 2005

Standard week Number	Phenophase	Temperature (°C)			Relative Humidity (%)		Sun shine Hours	Evaporation (mm/day)	Rainfall (mm)
		Maximum	Minimum	Mean	I	II			
26		32.2	24.0	28.1	83	71	1.1	2.7	127.0
27		33.5	25.7	29.6	78	64	3.2	5.1	9.0
28		29.3	24.6	26.9	87	77	1.4	2.1	66.4
29		33.5	25.1	29.3	79	61	5.5	3.7	28.8
30		27.8	23.0	25.4	88	82	0.1	1.8	149.0
31		29.5	23.5	26.5	81	80	0.7	2.7	65.4
32		30.6	22.7	26.6	79	68	4.4	3.2	6.2
33	Transplanting	31.2	22.5	26.9	85	70	2.6	3.3	33.8
34		30.5	23.3	26.9	81	65	4.2	3.0	6.8
35		34.7	25.1	29.9	81	58	7.6	4.5	1.8
36		32.4	24.3	28.3	86	71	5.4	3.1	72.4
37	Panicle initiation	30.6	23.9	27.2	80	70	1.7	2.5	12.2
38		29.9	22.9	26.4	82	75	4.1	3.4	253.4
39	Booting	32.5	23.7	28.1	80	57	7.8	3.9	0.0
40		34.9	23.1	29.0	78	49	8.6	4.4	0.0
41	Heading	32.9	22.3	27.6	83	59	5.7	3.6	43.4
42		29.4	22.6	26.0	90	73	4.5	2.0	89.2
43	Milky stage	31.1	20.9	26.0	77	53	7.0	2.9	2.5
44	Dough stage	30.5	18.3	24.4	77	43	5.9	3.4	2.2
45		30.5	14.5	22.5	81	35	8.2	3.3	0.0
46		30.7	13.6	22.1	80	31	9.1	3.3	0.0
Mean/Total		31.3	22.4	26.9	82	62	4.7	3.2	969.6

Table 2: : Weekly meteorological data recorded at RARS, Jagtial during *Rabi,* 2005-06

Standard week Number	Phenophase	Temperature (°C)			Relative Humidity (%)		Sun shine Hours	Evaporation (mm/day)	Rainfall (mm)
		Maximum	Minimum	Mean	I	II			
49		29.7	13.6	21.7	78	41	6.2	3.3	0.0
50		29.3	10.8	20.0	74	38	7.9	3.9	0.0
51		29.9	14.0	22.0	81	50	7.2	2.9	1.0
52		28.0	9.6	18.8	77	32	7.5	2.8	0.0
1		28.9	12.1	20.5	76	36	7.2	3.1	0.0
2		30.9	15.9	23.4	73	33	7.5	3.0	0.0
3	Transplanting	30.7	16.0	23.4	72	27	7.4	3.2	0.0
4		29.8	12.1	20.9	75	32	7.6	3.2	0.0
5		31.2	12.1	21.6	63	25	8.5	3.7	0.0
6		32.1	13.4	22.8	63	27	8.8	4.1	0.0
7		34.7	15.9	25.3	70	29	8.7	3.9	0.0
8		37.1	17.8	27.4	73	30	8.7	4.9	0.0
9		35.7	19.7	27.7	73	46	7.4	5.2	23.0
10	Panicle initiation	30.4	19.9	25.2	85	70	6.0	2.9	46.8
11		32.2	19.2	25.7	79	47	7.8	3.8	1.2
12	Booting	36.1	18.3	27.2	67	26	8.7	5.0	0.0
13		38.3	20.7	29.5	64	26	8.2	5.2	0.0
14	Heading	40.1	21.1	30.6	57	29	8.4	5.5	0.0
15	Milky stage	40.1	24.1	32.1	67	40	7.4	6.0	1.0
16	Dough stage	37.5	21.7	29.6	65	40	8.6	5.1	17.0
17		42.3	23.9	33.1	56	27	8.8	6.7	0.0
18		42.0	24.8	33.4	59	31	7.1	7.1	0.0
Mean/Total		34.0	17.1	25.5	70.3	35.5	7.8	4.3	90

Table 3: Day time variation in air temperature (°C) and relative humidity (%) in rice crop during *kharif*, 2005

Within crop canopy (10 cm height from ground level)																
Date	Air temperature (°C)								Relative Humidity(%)							
Time (Hrs)	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00
16.08.2005	27.5	28.0	29.7	30.8	30.5	30.9	*	*	75	70	64	61	65	61	*	*
06.09.2005	31.1	34.2	38.6	33.1	*	36.4	35.3	36.1	77	66	53	69	*	64	69	65
20.09.2005	27.1	30.3	28.8	31.0	*	*	28.1	27.5	85	68	77	68	*	*	82	81
04.10.2005	30.6	32.6	35.6	32.7	34.2	32.6	34.4	33.9	69	69	54	61	63	70	65	65
18.10.2005	31.0	30.3	31.2	33.0	31.9	30.7	29.6	29.9	78	78	76	71	75	74	81	79
01.11.2005	30.2	31.7	32.9	33.1	32.4	31.4	33.7	30.6	57	56	49	50	50	55	52	44
Above crop canopy (10 cm height above crop canopy)																
Date	Air temperature (°C)								Relative Humidity(%)							
Time (Hrs)	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00
16.08.2005	27.6	28	29.4	29.9	30.2	30.8	*	*	74	69	62	60	63	60	*	*
06.09.2005	31.0	33.5	38.4	32.9	*	36.7	35.1	35.7	74	64	50	67	*	55	62	57
20.09.2005	26.7	29.4	28.4	30.7	*	*	28.0	27.3	82	66	75	67	*	*	80	80
04.10.2005	30.3	31.7	34.3	32.4	33.7	32.5	33.4	33.9	63	66	48	56	55	65	59	63
18.10.2005	30.3	29.5	30.4	31.2	31.9	30.2	28.8	29.1	75	74	71	65	70	71	78	76
01.11.2005	29.5	30.3	31.7	32.0	32.1	30.6	32.2	31.2	50	42	37	41	37	42	43	43

Table 4: Day time variation in air temperature (°C) and relative humidity (%) in rice crop during *rabi,* 2005-06

Within crop canopy (10 cm height from ground level)																
Date	Air temperature (°C)								Relative Humidity(%)							
Time (Hrs)	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00
07.02.2006	22.2	24.1	26.6	28.0	30.0	30.3	30.4	30.7	49	43	38	35	30	27	25	25
21.02.2006	28.6	29.7	31.5	33.2	33.1	33.6	34.7	34.6	59	53	50	53	52	52	34	35
07.03.2006	30.7	30.9	31.9	31.0	32.5	32.2	*	*	63	63	64	66	64	61	*	*
22.03.2006	30.6	31.6	34.6	35.2	35.6	36.4	34.6	34.5	61	59	55	53	53	49	52	58
04.04.2006	32.0	33.9	35.0	36.1	35.9	37.1	37.8	35.8	65	65	63	62	63	58	54	51
18.04.2006	33.5	33.3	33.8	35.0	35.7	36.1	35.6	35.9	62	62	64	58	58	58	49	54
Above crop canopy (10 cm height above crop canopy)																
Date	Air temperature (°C)								Relative Humidity(%)							
Time (Hrs)	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00	9.00	10.00	11.00	12.00	13.00	14.00	15.00	16.00
07.02.2006	21.9	24.1	26.8	28.0	29.8	30.0	30.3	30.8	46	45	35	33	26	24	24	24
21.02.2006	26.7	29.0	30.7	32.4	33.1	33.4	34.7	34.6	55	46	46	44	46	43	29	31
07.03.2006	29.4	30.1	30.2	30.5	31.4	31.8	*	*	60	61	62	62	59	58	*	*
22.03.2006	28.7	29.5	31.7	32.9	33.0	34.3	33.9	33.8	58	56	46	44	44	42	42	46
04.04.2006	29.8	31.8	34.5	34.9	35.4	35.8	38.6	34.3	57	59	52	51	46	44	40	44
18.04.2006	30.9	30.5	31.8	32.5	33.4	34.6	33.8	34.2	59	59	55	49	50	44	44	45

humidity was found than in *rabi* season. Higher relative humidity and air temperatures were recorded within crop canopy than above crop canopy. The rice grain yields were higher during *rabi* compared to *kharif* season.

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