

Research Note

A preliminary study on attainment of maximum tillering as an important phenological stage in rice

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Rice varieties differ in (i) growing degree days (GDDs) above a base temperature of 10 °C required to reach panicle initiation from sowing and (ii) the duration of the thermo-insensitive phase from panicle initiation to physiological maturity (Reddy *et al.*, 2004; Jayapriya *et al.*, 2016; Venkataraman, 2017). Panicle Initiation is held to be the end of the vegetative phase in rice. Often GDDs are calculated from date of transplanting. It should be done from date of sowing as age of seedlings transplanted varies with varieties and seasons.

Medhi *et al.* (2017) had reported phenological observations recorded in *Kharif* 2015 at Jorhat, on 25 day old seedlings of a short and medium duration rice variety Luit and TTB 404, respectively, transplanted on 21 July, 5 August, 20 August and 4 September. They had recorded data on anthesis instead of panicle initiation. They had also recorded unreported additional observations on date of attainment of maximum tillering and GDDs above a base temperature of 10 °C on a daily basis. Further, it was decided to see if the additional observations could throw any fresh light on

phenology of rice. For the above, data on number of days, GDDs and air temperature for the phases (i) date of sowing to maximum tillering (ii) maximum tillering to anthesis (iii) anthesis to maturity and (iv) sowing to maturity were compiled and are set out (Table 1).

Late sown crop in its later stages experiences a much lower temperature than the early sown crop. The difference is quite marked for TTB 104 (Table 1). This is of importance in understanding phenology of the two rice varieties. Variety Luit and TTB 104 had taken (i) 43 and 75 days to complete maximum tillering and (ii) 101 and 137 days to reach physiological maturity, respectively. The difference between TTB 104 and Luit to (i) complete maximum tillering is 32 days and (ii) to reach physiological maturity is 36 days. The differences are nearly the same.

During maximum tillering to anthesis, the temperature is equable and the duration range is 29 to 31 days for variety Luit and 30 to 32 days for variety Fot TTB 104. However,

Table 1 : Phasic phenological data of rice varieties Luit & TTB-404 in *Kharif* 2015 at Jorhat

Dates of Sowing	Sowing (S) to Max. Tillering (MT)			MT to Anthesis (A)			A to Maturity (M)			S to M		
	Days	GDD	Temp (°C)	Days	GDDs	Temp. (°C)	Days	GDD	Temp. (°C)	Days	GDD	Temp (°C)
Luit												
26 Jun	44	856	29.5	31	565	28.2	27	507	28.8	102	1928	28.9
11 Jul	44	836	29.0	30	553	28.4	27	467	27.3	101	1856	28.4
26 Jul	43	797	28.5	29	545	28.8	26	404	25.5	98	1746	27.8
10 Aug	42	777	28.5	30	521	27.4	30	388	22.9	102	1686	26.5
TTB-404												
26 Jun	73	1421	29.5	31	598	29.3	30	452	25.1	134	2471	28.4
11 Jul	73	1389	29.0	32	564	27.6	31	390	22.6	136	2343	27.2
26 Jul	75	1413	28.8	30	452	25.1	30	317	20.6	135	2182	26.2
10 Aug	79	1415	27.9	31	375	22.1	33	245	17.4	143	2034	24.2

temperature drops from 29 °C to 22 °C from 26 Jun to 10 Aug sowing crops. If this phase was thermo-sensitive, the number of days for the 10 August sown crop should have been 50. However, it was found to be only 31. It depicts that this particular phase is thermo-insensitive. For the phase from anthesis to physiological maturity, for variety Luit the duration range is 26 to 30 days and the temperature drops from 29 °C to 23 °C. For TTB 104 the duration range is 30 to 33 days and the temperature drops from 25 °C to 17 °C. If this phase was thermo-sensitive for the 10th August sown crop the duration should have been (i) 40 instead of the observed 30 for Luit and (ii) 65 instead of the observed 33 for TTB 104. So this phase is also thermo-insensitive.

In view of the above, it is evident that differences in life duration of the two varieties are accounted for by differences in time taken to reach maximum tillering. Thus it would appear that development of rice becomes thermo-insensitive from the maximum tillering stage onwards. The average duration of the phase from maximum tillering to maturity is 57 days for Luit and 62 for TTB 104. However this duration can vary amongst rice varieties and range from 40 days (Islam and Sikder, 2011) to 85 days (Chaudhari *et al.*, 2017). The GDDs of about 800 °C-days and 1400 °C-days required to reach maximum tillering from sowing for variety Luit and TTB 104 seems to be the lowest and highest, respectively.

For *kharif* rice, the possibility of moisture insufficiency reducing phasic durations exists especially for late sown

crops. So to confirm the above deductions, results from studies from sowing date trials on irrigated rice involving attainment of maximum tillering as a factor in terms of GDDs need to be examined.

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