Agrometeorological analysis for selection of *rabi* sorghum genotypes

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Introduction

- Sorghum crop is predominantly grown during the *rabi* season (Sept.-Feb.) under receding soil moisture situation in Northern Dry Zone of Karnataka
- Growth and yield of crops therefore depend on non-rainfall meteorological variables during the crop growing period
- Crop growth in a given crop stage can considered as a function of: (1) biomass accumulation till the end of the previous stage and (2) weather conditions prevailing during that particular stage.
- The success of a genotype can be gauged, looking into, whether it is responsive to deviations in meteorological variables, and to what extent.

Objectives

- To assess the influence of weather variables on development of crop dry matter partitioning components
- To identify suitable rabi sorghum genotypes for Bijapur area in northern dry zone of Karnataka

Procedure

- **Field experiment for three years in different growing environments:**

  Genotypes: M35-1, 9-13 and GRS-1

- **Observations on dry matter partitioning components:**

  leaf, stem and earhead weight

  At 15 days interval, covering the stages:
  Seedling (0-30 DAS), primordial initiation (30-45 DAS), Flag leaf initiation stage (45-60 DAS),
  Flowering (60-75 DAS) and Grain filling (75-90)

Procedure contd..

Correlation analysis

Dry weight of individual DMP components in each growth stage	Dry weight of individual DMP components till the previous stage
	Weather variables during the prevailing stage

- Selection of genotypes is made based on low or no significant role of weather on the growth and development
- Identified the weather variables having maximum influence

Results

- Looking to the highest values of correlation coefficient, models were developed through stepwise multiple regression analysis for:
  - » **Individual DMP components**
  - » **In each stage of crop growth**

- The models are…..

The Models

Stage	Compo-nent	Model: var. M35-1	R
Seed-ling	LEAF	Y= 1.41(TX30)+1.35(EP30)-48.3	0.95
	STEM	Y= 0.12($RH_2$30)+8.8	0.76
PI	LEAF	Y= - 3.40($VP_2$45)+9.93(L030)+36.5	0.84
	STEM	Y= - 0.8($VP_2$45)+3.76(L030)+7.9	0.85
Fl-Lf	LEAF	Y= 0.91($RH_1$60)+1.45(TR60) + 1.85(S045)-83.2	0.94
	STEM	Y= 18.4(TR60)+6.34(S045)-281.6	0.80
Flow	LEAF	Y= 3.40(TX75)-0.56(CBSS75) +0.15(L060)-30.7	0.94
	EH	Y= 4.83($RH_1$75)-336.9	0.72
GF	LEAF	Y= 15.5(EP90)-88.7	0.71
	STEM	Y= - 3.41($VP_1$90)+1.10(CBSS90)-94.4	0.71
	EH	Y= 2.38($VP_2$90)+0.93(EH75)-31.7	0.89

Stage	Component	Model: Var. GRS-1	R
Seed-ling	LEAF	Y= 1.48(TX30)-0.05($RH_2$30) +0.05(EP30) -39.8	0.87
	STEM	Y= -0.09($RH_2$30)+0.1(RHR30)+3.9	0.88
PI	LEAF	Y= 2.79($VP_2$45)+0.68(L030)-31.3	0.59
	STEM	Y= 2.75($VP_2$45)-3.90(S030)-29.4	0.68
Fl-Lf	LEAF	Y= 0.89(TN60)+2.60(TR60) +1.89(S045)-42.3	0.86
	STEM	Y= 0.13(TR60)+4.89(S045)+9.9	0.96
Flow	LEAF	Y= -0.45(RHR75)-0.35(CBSS75)+68.0	0.86
	STEM	Y= 5.83($VP_2$75)+0.59(S060)-37.5	0.95
	EH	Y= 3.01(TX75)+0.13(S060)-82.0	0.92
GF	LEAF	Y= 3.37(EP90)-0.24(L075)-13.7	0.92
	STEM	Y= -1.65(RHR90)-2.33(GDD90)+357.2	0.85
	EH	Y=- 0.95(TN90)+0.91(RHR90) - 1.28(GDD90) +175.5	0.91

Stage	Component	Model: var. 9-13	R
Seed-ling	LEAF	Y= 1.58(TX30)+0.74(EP30)-49.2	0.97
	STEM	Y= 0.21(TX30)-0.046($RH_2$30)+0.09(RHR30)-4.8	0.86
PI	LEAF	Y= 7.17(L030)-5.07	0.78
	STEM	Y= 2.03($VP_2$45)-23.3	0.75
Fl-Lf	LEAF	Y= 0.53(TN60)+1.99(TR60) +2.20(S045)-34.0	0.98
	STEM	Y= 2.24($RH_1$60)+1.87(TR60) +1.82(L045)-186.4	0.98
	LEAF	Y= 0.18(S060)-1.84	0.80
	STEM	Y= 1.98(S060)-1.52(L060)+11.6	0.95
	EH	Y= - 8.21(TN75)+6.05(BSS75)+80.4	0.73
GF	LEAF	Y= 4.98($VP_2$45)-0.55(RHR90)-66.2	0.86
	STEM	Y= - 13.9(TN90)+159.9	0.80
	EH	Y= -10.74($VP_1$45)+0.71(RHR90) +0.06(CBSS90) +101.3	0.70

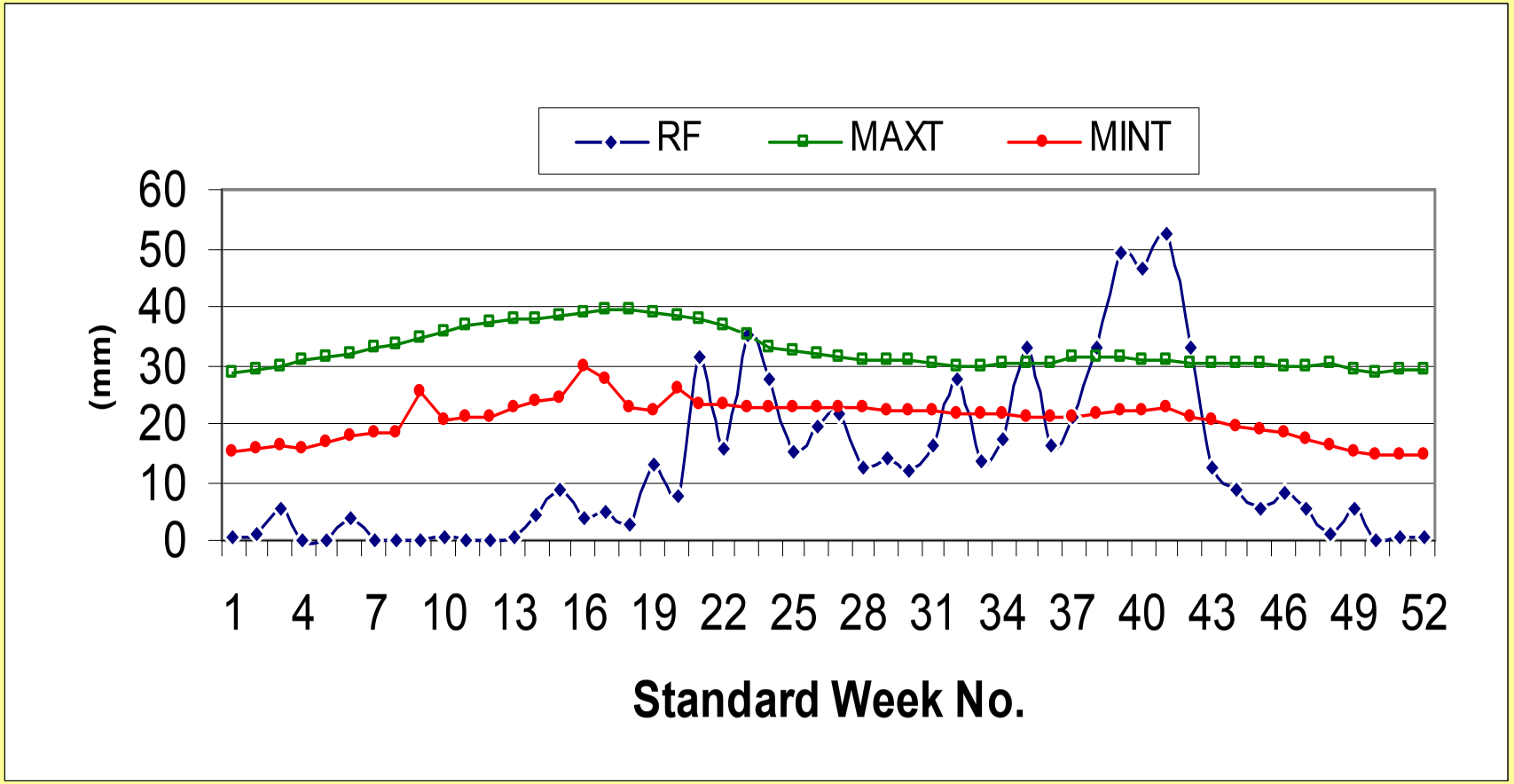
Response of sorghum genotypes to weather

Stage	Component	M35-1	GRS-1	9-13
Seedling	Stem, leaf	Higher Maxt, Lower atm. moisture	Higher Maxt, Lower atm. moisture	Higher Maxt, Lower atm. moisture
PI	Stem, leaf	Stem, lower atm. moisture	Stem, higher atm. moisture	Stem, higher atm. moisture
Flagleaf	Stem, leaf	TR, dm	TR, dm	TR, dm
Flow	Stem	-	Dm	dm
	EH	RH1	MaxT, dm	MinT, BSS
GF	EH	Vp1, EH	MinT,RHR, GDD	VP1, RHR, BSS

Correlation of yield with minimum temperature in grain filling stage

Cultivar	MaxT	MinT	RH1	RH2
M35-1	0.22	-0.82	0.29	-0.77
GRS-1	-0.10	-0.72	0.42	-0.66
9-13	0.40	-0.60	0.22	-0.78

Climate information



Conclusion

1. M35-1 variety can sustain lower humidity levels in primordial initiation stage
2. Ear head growth during grain filling stage in M35-1 variety is least responsive to meteorological variables.
3. Yield of rabi sorghum variety M35-1 is responsive to low minimum temperature during grain filling stage. The minimum temperature corresponding to the time grainfilling stage generally occurs in Dec-Jan.

Hence the variety M35-1 genotype is considered as weather tolerant , and is identified as most suitable for the Northern Dry Zone of Karnataka

Thank you