INFLUENCE OF WEATHER PARAMETERS ON SOYBEAN YIELD AND YIELD ATTRIBUTES GROWN IN DIFFERENT CROPPING SYSTEMS AND SOWING DATES IN THE KRISHNA GODAVARI ZONE OF ANDHRA PRADESH



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Soybean: a pulse cum oilseed crop, contributes to 55% of world oil seed production

- In India soybean occupies third place among the oil seed crops
- Soybean can be cultivated round the year in Andhra Pradesh state and the average productivity in the state is around 1200 kg ha $^{-1}$ as against the potential yield of 3000 kg ha^{-1}
- Soybean is mostly grown as a rainy season crop
- Productivity of soybean is mostly influenced by variations in the weather parameters like rainfall

OBJECTIVE

- To study the influence of different macro weather parameters on soybean seed yield and yield attributes grown in different cropping systems and sowing dates

EXPERIMENTAL DETAILS

- Design : split plot
- Replications : 3
- Plot size : 14.4 x 6.0 m^{-2}
- Period of experimentation: *kharif* and *rabi* 2001-02 and 2002-03
- SPACING ADOPTED IN DIFFERENT CROPS

  Soybean : 30 x 7.5 cm

  Pigeonpea : 240 x 15 cm

  Cotton : 120 x 60 cm

Main Treatments : Dates of sowing (4)

	2001	2002
D1	8.6.01	14.6.02
D2	23.6.01	02.7.02
D3	22.7.01	30.7.02
D4	21.8.01	22.8.02

Sub treatments : Cropping systems (4)

CS1: Cotton (L 604)+ soybean (JS 335) [1:2]
CS2: Pigeonpea (LRG 30)+ soybean [1:7]
CS3: Soybean (JS 335) - chickpea (ICCV 2)
CS4: Soybean (JS 335) - mustard (LBM 428)

PHENOLOGICAL STAGES RECORDED IN SOYBEAN

Growth phase	From	To
Vegetative (P1)	sowing	1st flowering
Pod set (P2)	1st flowering	bean formation
Seed fill (P3)	bean formation	lower leaves turn yellow
Maturity (P4)	lower leaves turn yellow	harvest

WEATHER PARAMETERS RECORDED

- Maximum temperature
- Minimum temperature
- Morning relative humidity
- Afternoon relative humidity
- Sunshine hours
- Evaporation
- Rainfall

OBSERVATIONS RECORDED

- Crop phenology
- Plant height
- Dry matter production and partitioning to leaf, stem and pods
- No. of branches per plant
- No. of pods per plant
- Test weight
- Seed yield
- Haulm yield

Seed yield (kg ha^{-1}) of soybean as influenced by dates of sowing and cropping systems during 2001 and 2002

Cropping system	Dates of sowing									
	2001					2002				
	8 June	23 June	22 July	21 Aug	Mean	14 Jun	2 July	30 July	22 Aug	Mean
Cotton + soybean	536	605	722	767	658	147	197	278	298	230
Pigeonpea + soybean	1403	1094	1611	1319	1357	402	388	528	485	451
Soybean –chickpea	2072	1622	2389	1756	1960	479	432	642	560	528
Soybean – mustard	2089	1563	2408	1758	1955	471	429	615	567	521
Mean	1525	1221	1783	1400		375	362	516	477	
	Date	System	D x S			Date	System	D x S		
SEm±	15.7	19.4	38.7			5.9	8.3	16.7		
CD (0.05)	54	57	113			21	24	49		

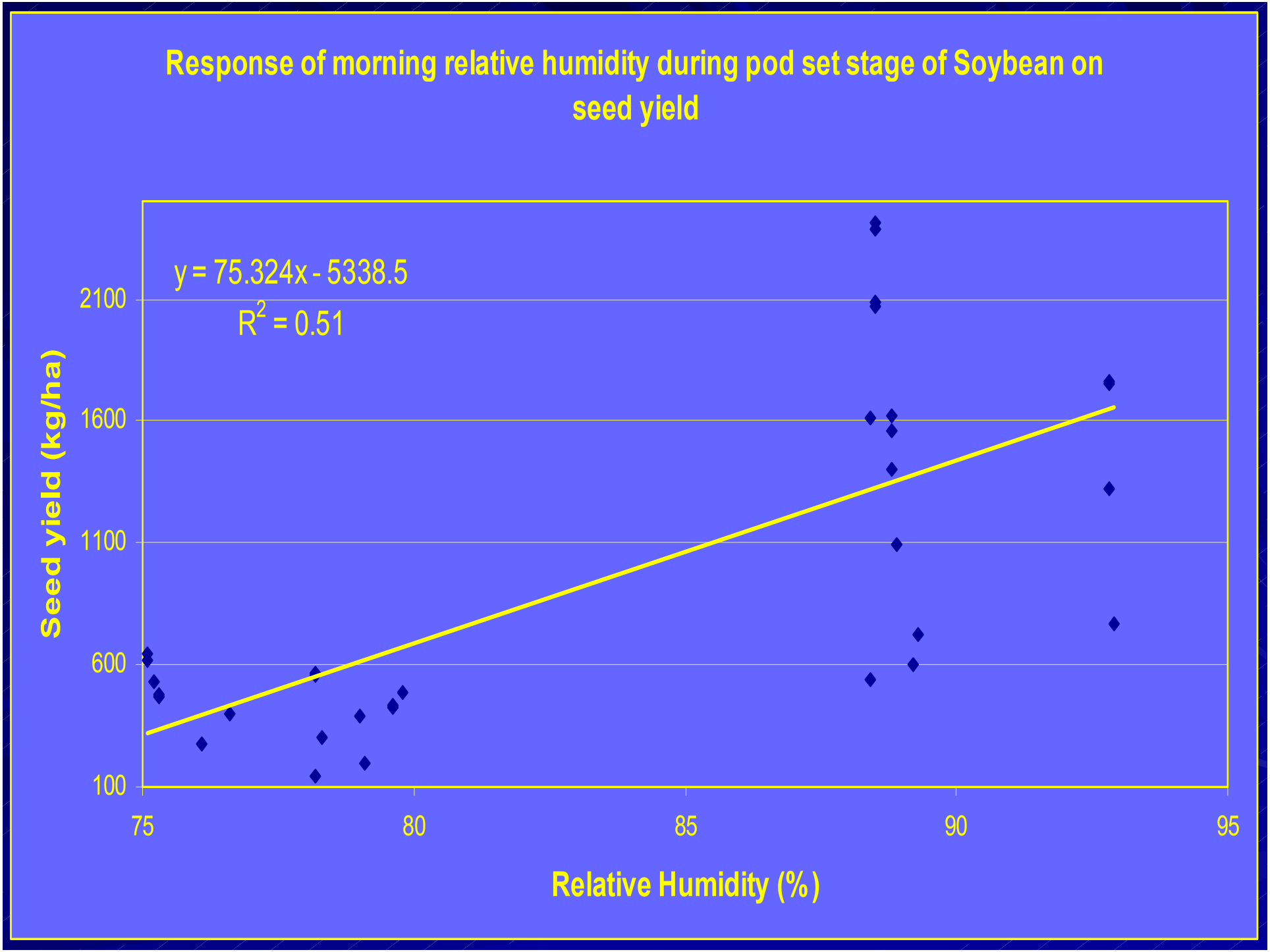
- At the end of the vegetative phase (P1) of soybean; the rainfall (r = 0.44*), RH I (r = 0.44*), RH II (r = 0.64**), and soil moisture at 15 cm (r = 0.59**) and at 30 cm soil depth (r = 0.55*) had strong significant positive correlation with seed yield

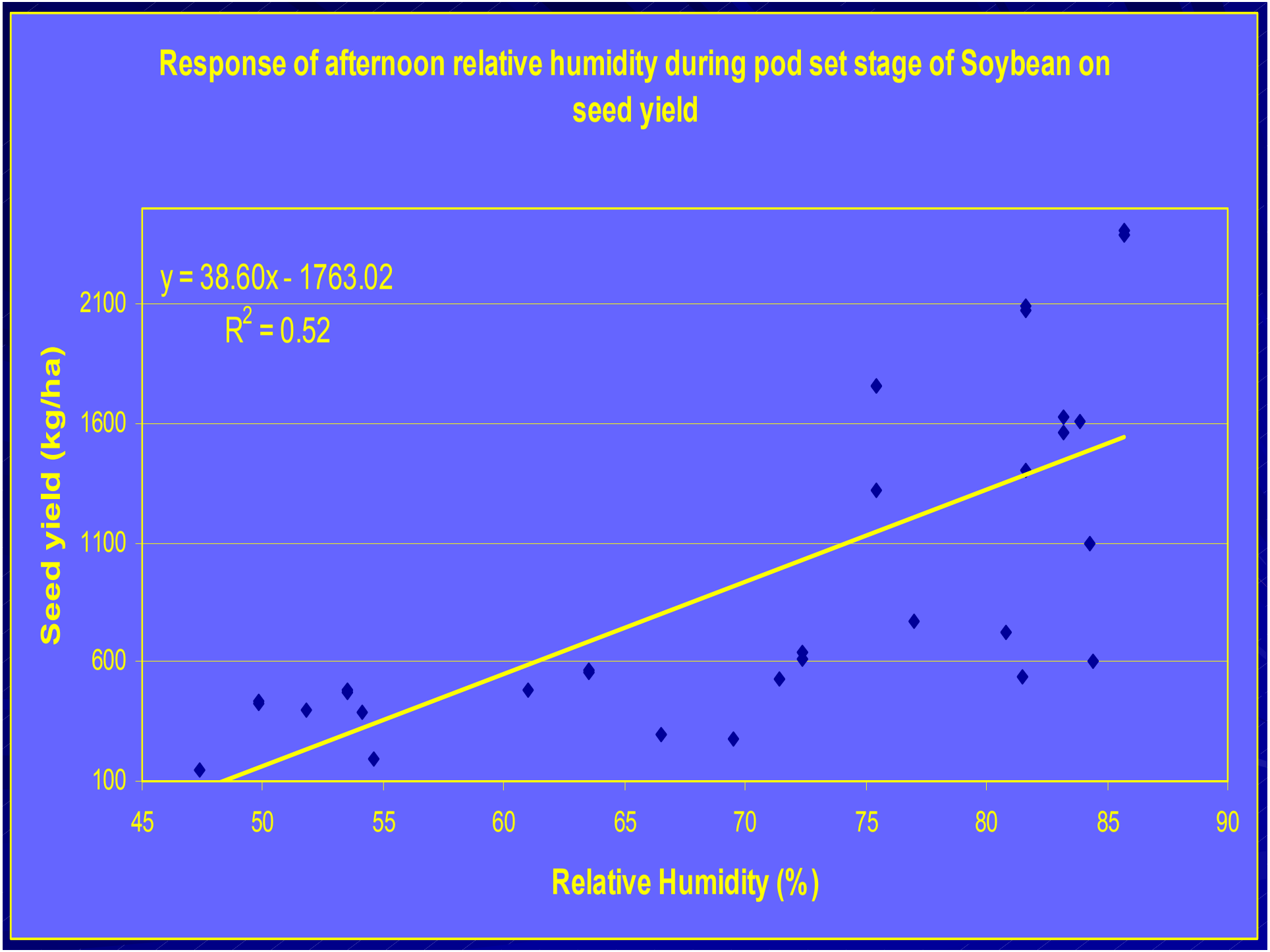
- During the pod set phase (P2) of soybean, the Tmin (r = 0.60**), RH I (r = 0.71**) and RH II (r = 0.74**) had a strong significant positive correlation with seed yield

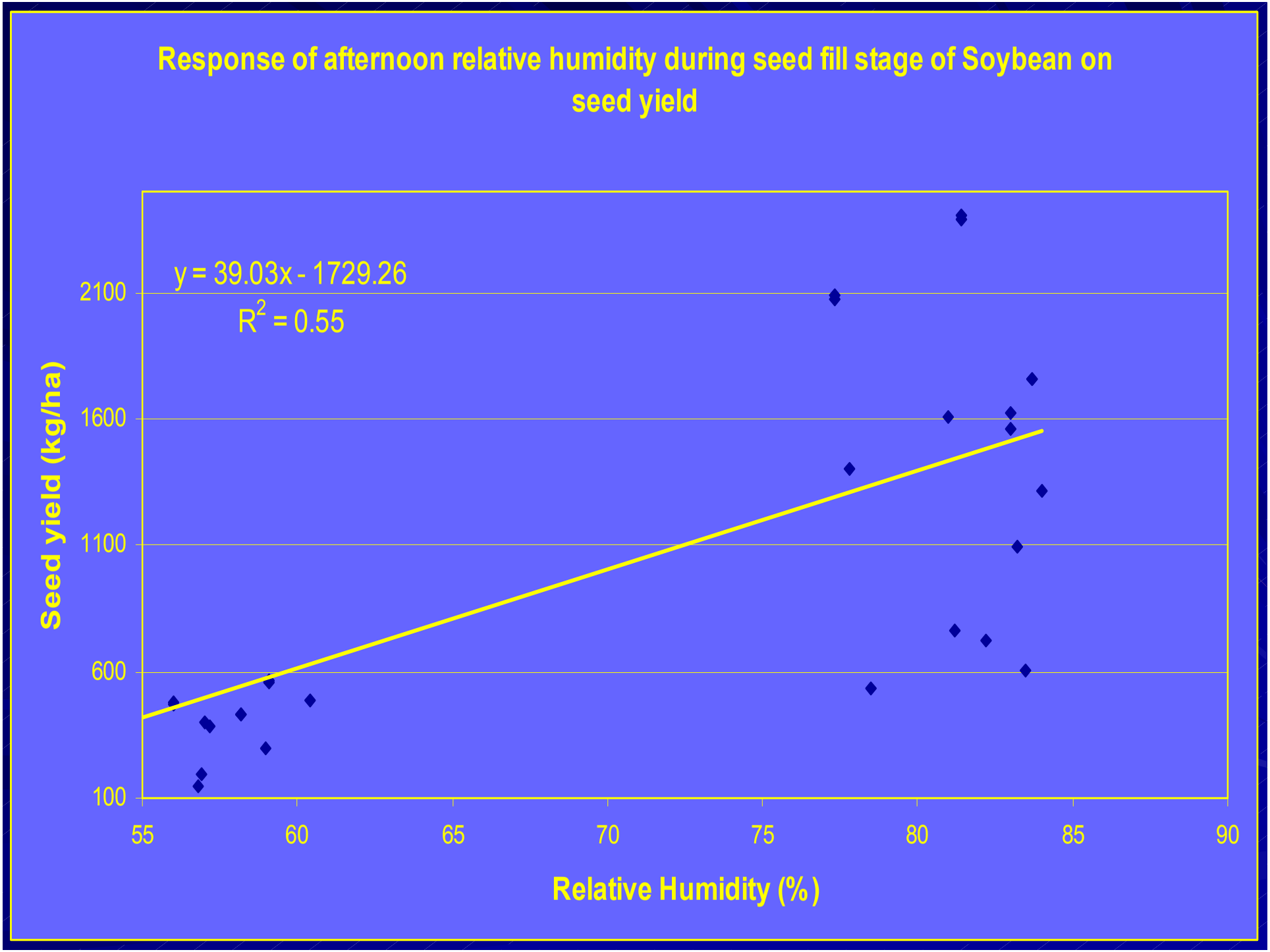
- the mean RH I and RH II of the seed fill (P3) and maturity (P4) phases also had significant positive correlation with seed yield of soybean

Coefficient of determination (R2), intercept (a) and slope (b) obtained from regressing weather parameters against seed yield of soybean

Weather parameter	a	b	R^2
Vegetative phase (P1)			
Rainfall	600.63	2.90	0.20
RH I	-2067.28	38.43	0.18
RH II	-1579.22	39.44	0.42
Soil moisture 15 cm	-377.68	52.65	0.35
Soil moisture 30 cm	-214.19	45.62	0.31
Pod set phase (P2)			
T min	-24496.75	1053.31	0.37
RH I	-5338.46	75.32	0.51
RH II	-1763.02	38.60	0.52
Seed fill phase (P3)			
RH I	-4240.40	60.43	0.37
RH II	-1729.26	39.03	0.55
Maturity phase (P4)			
RH I	-3109.24	46.66	0.25
RH II	-0980.04	27.81	0.33


Response of morning relative humidity during pod set stage of Soybean on seed yield
y = 75.324x - 5338.5
R2 = 0.51
Seed yield (kg/ha)
2100
1600
1100
600
100
75
80
85
90
95
Relative Humidity (%)


Response of afternoon relative humidity during pod set stage of Soybean on seed yield
y = 38.60x - 1763.02
R2 = 0.52
Seed yield (kg/ha)
2100
1600
1100
600
100
45
50
55
60
65
70
75
80
85
90
Relative Humidity (%)


Response of afternoon relative humidity during seed fill stage of Soybean on seed yield
y = 39.03x - 1729.26
R2 = 0.55
Seed yield (kg/ha)
2100
1600
1100
600
100
55
60
65
70
75
80
85
90
Relative Humidity (%)

SOYBEAN SEED YIELD AS INFLUENCED BY DIFFERENT WEATHER PARAMETERS

Model I : $Y = 1696.24 + 31.03x_1 + 16.29x_2 - 108.28x_3 + 71.11x_4$

$R^2 = 0.66$

Where,

Y = Soybean seed yield (kg ha^{-1})

x_1 = mean morning relative humidity during the vegetative phase

x_2 = mean afternoon relative humidity during the pod set phase

x_3 = mean morning relative humidity during the seed fill phase

x_4 = mean afternoon relative humidity during the seed fill phase

- **Model II : $Y = 237.4 + 20.47x_1 - 45.24x_2 + 45.43x_3$**
  $R^2 = 0.62$

Where,

Y= Soybean seed yield (kg ha-1)

x_1= mean afternoon relative humidity during the pod set phase

x_2= mean afternoon relative humidity during the seed fill phase

x_3= mean afternoon relative humidity during the seed fill phase

Weather factors contributing to higher yield of soybean

	RF (mm)	SM15 (%)	SM30 (%)	RHI (%)	RHII (%)	Tmin (°C)
P1	384	40	37	92	81	-
P2	-	-	-	89	82	24.5
P3	-	-	-	93	82	-

CONCLUSION

- The variation in seed yield of soybean can be attributed to the variation in the relative humidity in different phenophases.
- Soybean as sole crop or in combination with pigeonpea or cotton can be sown during the 2nd fortnight of July.


Thank You