

Website link- http://www.nipgr.ac.in/SCIPdb.php

Phenome: Interactive Visualizations

Users are presented with three kinds of interactive visualization, in the phenomics section of SCIPDb.

1) Interactive stress matrix:

a) The user will be able to access an interactive stress matrix by clicking on the highlighted tab as shown below.

Combined stress: Simultaneous and Sequential stress data

	hysiological and biochemical data)				
STEP I : CATEGORY:	 This section of the SCIP database hosts comprehensive literature information for various stress combinations. The phenome depicts the net impact of individual and combined stress on a plant in comparison 				
Choose a Category: Select Category 🗸	with non-stressed control, and also the interaction between the stresses at plant interface. The phenomic data represented here include a) growth and yield attributing traits directly showing the impact of combined stress on plants. E.g., yield, biomass, plant height etc, b) physiological and virulence-associated/immunity related/ pathogen defence-related traits indirectly showing the net impact of stress on plants. E.g., photosynthetic rate, stomatal conductance, bacterial number, cell death etc, and c) biochemical parameters showing the net impact of stress E.g., RUBISCO content, proline content etc.				
STEP II: SUBCATEGORY:	 The net impact of stress was assessed by calculating the percentage reduction in the value different growth and physiological parameters measured under combined and individual stre 				
Choose a Subcategory: Please select Subcategory ~	 over their non-stressed control plants Information can be accessed directly by choosing desired stress combination and crop of interest from the drop down menu on the left side. Order within stress combination is based on the dominant stress. Based on methodology followed for combined stress imposition, articles categorized into simultaneous stress (both the stresses imposed together) articles and sequential stress (stress imposed one after another in a sequential manner with overlap of one stress over other stress) 				
STEP III: PLANT SPECIES:	articles. This section also includes the studies where more than two stresses were imposed simultaneously/sequentially during the experiment.				
Choose a Plant: Please select Plant ✓	Individual data page for each stress combination has two parts, first part depicts the View more				
Reset Submit					
as compared to individual stresses. Also provide	nolistic view and trends in a large number of stress combinations represented in the databas des information on the geographical distribution of stress combinations. sed on stress combination) View geographical distribution				

b) The user can choose between the stress combination categories by clicking on any of the 3 tabs which is highlighted below, namely Abiotic-Abiotic, Biotic-Biotic or Abiotic-Biotic.



Website link- http://www.nipgr.ac.in/SCIPdb.php



c) Once the user chooses any of the three stress combinations categories (here Abiotic-Abiotic) corresponding interactive stress matrix will be displayed.

d) The size of each box is directly proportional to the number of studies reported for that particular stress combination.

e) On cursor hover over each box, other information's like corresponding name of stress combination, plant, outcome (whether positive or negative) and total no. of studies are presented.

f) Colour of each of the boxes in the stress matrix depicts whether the particular stress combination is detrimental to the plant or not (net impact, green: positive, red: negative and blue: when no inference was ascertained).







g) The interactive stress matrix can be filtered based on parameter, plant and also by selection of stress combination.

h) Based on the filter criteria, stress matrix pertaining to that specific selection criteria will be displayed.

i) The parameter selection can be done from the drop down shown in the highlighted section below.



j) The user can select the plant of their interest as shown below.

biotic-Abiotic																	Parameter (All)
Decugit & cold' fassing Main		Drought & cold' Dr freezing fr Creeping Ne beatgram		& cold	Haavy motal & UV Wheat		netal &			High/s temper virus Bonna popper		High/low temperature & virus Jimnon weed	High/low temperature & virus Cucumber		High/lov & virus Nicotian beathan	v tecupocaturo na niana	Plant (AII) (AII)
									High low temperature & virus Ground charry		Highler	v bengoszturo	Alfalfa Avocado Barley Bell Pepper				
Desgle & rold Storing Rise			Drought & cold freezing Tas	: Henry metal & UV Liver wort		netal &	Phooling/waterlogging & high light Pices slitchensis			High-low temperature & virus Tohacco		High/low temperature & virus Melon		A view Papaga		Birch Bonnet pepper Broccoli Bruguiera gymnorrhiz California wild grape Canola	
Nonglé & cold Sweeing Dought & cold & Sugarcana Diset		Drought & cold/ finezi Sugarcane	•	Heavy metal & UV Ministeri				Flooding/waterlogging & high light Sweet potato		Highflow temperature & virus Temastile		Drought & cold/ favoring Crease bush	Drought & cold/firecting Graperine	Ozone & I teropratur Birch	Ozone & Low tempetane Barch	Canola Cassava Citrus Cotton Creeping bentgrass Creosote bush	
ð Á ðungði Afg	Salt & drought Canada	Salt & droug Sea parala	• :	Salt & drought Splinach	Light and cold/Docing/los-temperature Tenante		Low temperatur Cotten	re and UV	Low	Nutrient deficiency/loni Tomato	sicity & cold	National					Cucumber Diatoms Fremont cottonwoo Grapevine Ground cherry Heritlera littoralis
dt & drought	Salt & drought Pen												Drought & cold/fronting Jojoha	Drought & cold/freezing Soybean			Jatropha Jimson weed Jojoba Kentucky bluegrass Liverwort
Yuuri -	Salt & decught Quince	Salt & Sunfi	decoght		Light and cold/freezing/low-temperature Seybean		Low Important and UV Mains		National deficiency/tranicity al cold Whenet						Maize Mangrove		
Nought and High light Drought and High	light Drought	and High light	Drought and H Sorghum	figh light		Salt & heat Kire	Salt & he Thalecre	at Salt i m Alfal	t cold/freezing		Salt & high light Distorm	Salt & high light Mangrove	Low	Low	Salt & heat Maine	Salt & beat Tomato	



k) Finally, the user can select the stress combination in which they are interested, as depicted below.





2) Interactive radial tree diagram:

User can see the net impact of the combined stress by clicking the highlighted portion "View net impact (Based on stress combination)"



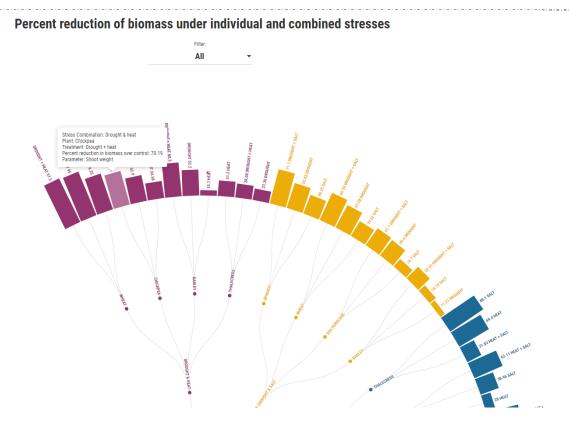
STEP I : CATEGORY:	This section of the SCIP database hosts comprehensive literature information for various stress combinations. The phenome depicts the net impact of individual and combined stress on a plant in comparison
Choose a Category: Select Category 🗸	 with non-stressed control, and also the interaction between the stresses at plant interface. The phenomic data represented here include a) growth and yield attributing traits directly showing the impact of combined stress on plants. E.g., yield, biomass, plant height etc. b) physiological and virulence-associated/immunity related/ pathogen defence-related traits indirectly showing the net impact of stress on plants. E.g., photosynthetic rate, stomatal conductance, bacterial number, cell death etc, and c) biochemical parameters showing the net impact of stress E.g., RUBISCO content, proline content etc.
STEP II: SUBCATEGORY:	 The net impact of stress was assessed by calculating the percentage reduction in the values of different growth and physiological parameters measured under combined and individual stresses over their non-stressed control plants
Choose a Subcategory: Please select Subcategory >	 Information can be accessed directly by choosing desired stress combination and crop of interest from the drop down menu on the left side. Order within stress combination is based on the dominant stress.
	 Based on methodology followed for combined stress imposition, articles categorized into simultaneous stress (both the stresses imposed together) articles and sequential stress (stress imposed one after another in a sequential manner with overlap of one stress over other stress)
STEP III: PLANT SPECIES:	articles. This section also includes the studies where more than two stresses were imposed
	 This section also includes the studies where more than two subsets were imposed simultaneously/sequentially during the experiment.
Choose a Plant: Please select Plant v	Individual data page for each stress combination has two parts, first part depicts the View more
Reset Submit	Click Here
The phenomics data visualization links can aid users to decipher a holi as compared to individual stresses. Also provides View stress matrix <u>View net impact (Based</u>	stic view and trends in a large number of stress combinations represented in the database information on the decorrange al distribution of stress combinations. on stress combination) View geographical distribution

a) After clicking above highlighted tab, the user will be redirected to a page containing an interactive radial tree.

b) The radial tree visualization is presented as a three level, hierarchical depiction.

- 1. The first level (starting from inside, the node of tree), depicts the stress combinations.
- 2. Plant species whose study are available for respective stress combinations are depicted at level 2 of the radial tree.
- 3. Level 3, shown in the form of stacked bar diagram, illustrates the percent reduction of specific parameters (here biomass), between the two individual and combined stress.

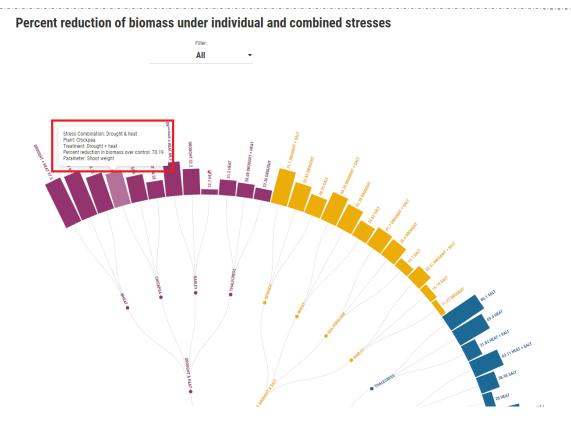




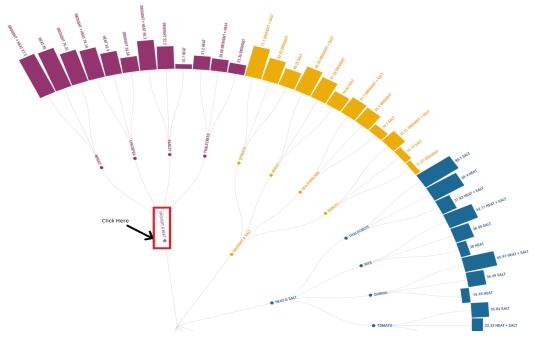
c) The tree has been colour coded based on stress combinations.

d) Each of the bar diagram is interactive and on hover other details are presented (highlighted below).





e) If the user wants to visualize just a particular stress combination tree, on clicking the corresponding node data pertaining to that selection is only presented in the form of radial tree. For example, For Drought and Heat stress combination selection of corresponding node, is highlighted below.



Page **7** of **13**

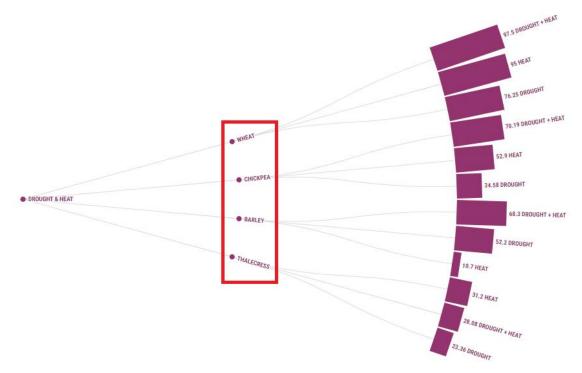
Copyright SCIPDb 2022



f) After clicking on the "Drought & Heat" node corresponding subtree will be generated like the one shown below.

g) The tree then will be again branched for different plant species in which the corresponding studies have been done.

h) In the depiction shown below, for "Drought & Heat", studies were available for Wheat, Chickpea, Barley and Thale cress, hence four sub nodes are shown in the visualizations.



i) Each of the species will be having 3 bar graphs as highlighted below. The user can select the species in which they are interested in and the corresponding tree for that species will be displayed (For eg. wheat).



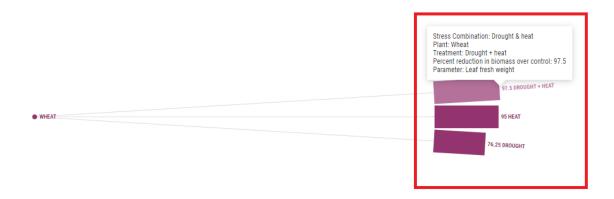


j) Each of the bar graphs represents the individual stresses (**Heat, Drought**) and the combined stress (**Drought + Heat**)

k) A net impact score (in the form of percent reduction over control) is displayed for individual and combined stress for easy comparison.

h) The height of the bar graph depends on the value of the net impact.

i) Here it can be inferred that the combined stress was more detrimental for wheat yield and productivity, since the percent reduction in biomass was greater in case when wheat was exposed to combined drought and heat stress combinations when compared to individual drought and heat stresses.





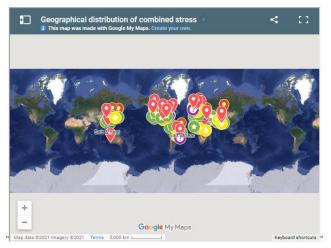
3) Geographical distribution:

a) Users can see the global geographical distribution of the combined stress studies conducted across the world by clicking the highlighted portion "View geographical distribution"

Combined stress: Simultaneous and Sequential stress data (Morphological, physiological and biochemical data)

STEP I : CATEGORY: Choose a Category: Select Category ~	 This section of the SCIP database hosts comprehensive literature information for various stress combinations. The phenome depicts the net impact of individual and combined stress on a plant in comparison with non-stressed control, and also the interaction between the stresses at plant interface. The phenomic data represented here include a) growth and yield attributing traits directly showing the impact of combined stress on plants. E.g., yield, biomass, plant height etc., b) physiological and virulence-associated/immunity related/ pathogen defence-related traits indirectly showing the net impact of stress on plants. E.g., photosynthetic rate, stomatal conductance, bacterial number, cell death etc, and c) blochemical parameters showing the net impact of stress E.g., RUBISCO content,
STEP II: SUBCATEGORY:	proline content etc. The net impact of stress was assessed by calculating the percentage reduction in the values of different growth and physiological parameters measured under combined and individual stresses
Choose a Subcategory: Please select Subcategory ∽	 over their non-stressed control plants Information can be accessed directly by choosing desired stress combination and crop of interest from the drop down menu on the left side. Order within stress combination is based on the dominant stress. Based on methodology followed for combined stress imposition, articles categorized into simultaneous stress (both the stresses imposed together) articles and sequential stress (stress imposed one after another in a sequential manner with overlap of one stress over other stress)
STEP III: PLANT SPECIES:	articles. • This section also includes the studies where more than two stresses were imposed
Choose a Plant: [Please select Plant ∽]	simultaneously/sequentially during the experiment. Individual data page for each stress combination has two parts, first part depicts the View more
Reset Submit	
as compared to individual stresses. Also prov	holistic view and trends in a large number of stress combinations represented in the database ides information on the geographical distribution of stress combinations.

b) After clicking the "view geographical distribution" the corresponding interactive geographical map will be displayed which can be zoomed.

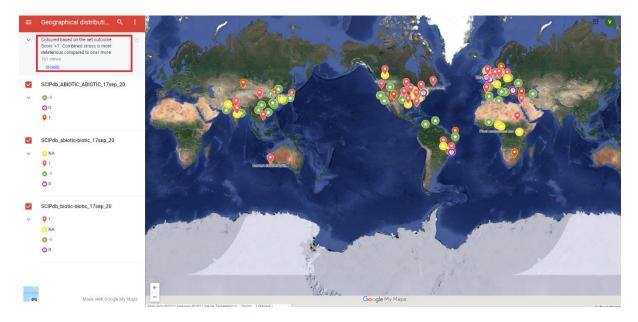


Combined stress world map

c) The geographical map has been organised and layered based on three major categories, Abiotic-Abiotic, Abiotic-Biotic, and Biotic-Biotic (See screenshot below).

Page **10** of **13**





d) The corresponding locations are coloured based on the net outcome score.

- 1. If the score is "+1", then the combined stress is deleterious compared to the individual stresses.
- 2. If the score is "-1" then the combined stress is less deleterious compared to the individual stresses.

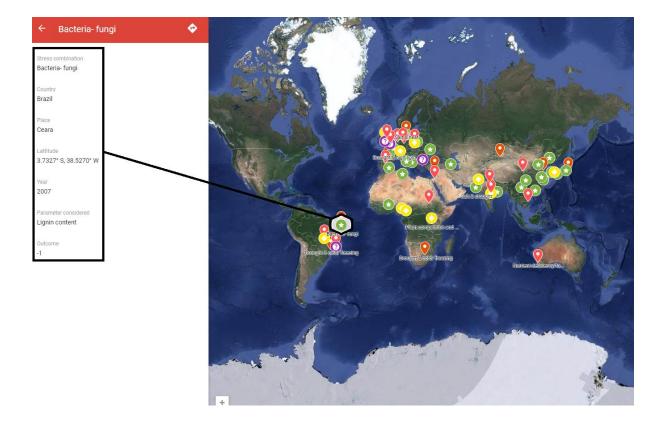
e) On clicking the mapped location, corresponding details can be fetched.

- the stress combination studied,
- country and place in which the study was conducted,
- latitude,
- year in which the study was conducted,
- parameter considered in the study,
- net outcome

f) This information is displayed in the highlighted portion towards the left side of the map. Illustration for Bacteria and Fungi and Drought & Cold/Freezing are illustrated in depictions below.



g) Here for stress combination "Bacteria-Fungi" studied in Ceara, Brazil, the net outcome is "-1", which means bacterial and fungal stress combination is less detrimental compared to the individual stresses (see screenshot below).

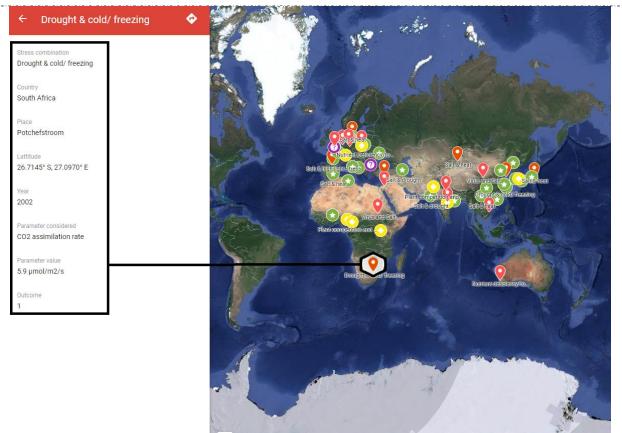


h) Here stress combination studied is "Drought & Cold/Freezing" in Potchefstroorm, South Africa, the net outcome is "1", which means the stress combination is more detrimental compared to the individual stresses (see screenshots below).



Stress Combination and their Interactions in Plants (SCIP) Database

Website link- http://www.nipgr.ac.in/SCIPdb.php



Copyright SCIPDb 2022