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Invent of SAU-GROWTH METER for the production of wheat crop (*Triticum aestivum L.*)

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Abstract:

Wheat crop is one of the most important cereal crops in all over the world, so, many efforts have been taken to increase its yield from last many years, but higher yield requires modern innovations. This theoretical idea was existing among the some students of Sindh Agriculture University, Tandojam (Pkaistan) in 2010 and then a practical work started to achieve this goal. After continuing research, a growth meter was invented successfully and it was also brought under study which was conducted in the end of 2013 at Wheat Research Institute (WRI) Sakrand (Pakistan) and an invented growth meter, named as "SAU-GROWTH meter was utilized first time" (model is available).

SAU-GROWTH meter is used for measurement of growth speed of wheat crop plant. It is a scientific instrument, which functions with

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the help of its formulae and fixed values. The formula works both manually and with computer software. Its standards used for comparison to check the growth speed of growing crop. This instrument provides scientific measurement for the wheat crop growth speed parameter. From sowing to maturity growth speed status will greatly help to estimate, understand, analyze, evaluate, manage and resolve the factors influence on crop production and can be recorded for higher yield.

In 2014, SAU-GROWTH meter was first time used on newly introduced Benazir wheat variety and proved successful. A measurement was taken in growth speed of plant (GSP) units at crop maturity stage and it was calculated through its formulae, the growth speed was determined 11.25 GSP/month (2.81/Week, 0.37/day GSP) out of 11.42/month standard GSP. According to SAU-GROWTH meter standard GSP, it is significant. Each wheat variety has its own standard GSP fixed by a law.

Key words: SAU-invent, Crop growth, Latest science, wheat, Maturity.

Introduction

SAU-GROWTH meter is a scientific instrument which helps in measurement of plant growth speed of many plants, like wheat, cotton, rice etc, but initially it is designed for wheat crop. This instrument functions with the help of its Formulae and fixed values scaled on the meter. Its standards used for wheat crop for comparison to check the growth speed status of plant. It is smartly working on wheat crop. This instrument provides scientific measurement for the wheat crop. The Measurement of wheat crop growth speed is very much useful for better crop management for higher yield. Status of wheat crop plant growth will greatly help management of inputs and judicious use of sources while understanding the crop growth. SAU-GROWTH meter shows the growth performance of wheat crop according to its standards through its growth speed. This

instrument will solve many agricultural issues related crop production. The meter consists of growth speed of plant (GSP) scale, connecting rod, observation mirror, crop color chart (screen), the stand, SAU-GROWTH working standards. The meter has 60 GSP units, one GSP unit is equal to two centimeter thus a meter is four feet long in length which configured useful to all wheat varieties in Pakistan. There are many methods/parameters used for wheat crop growth speed measurement such as germination, plant height, leaf area index, relative growth rate and net assimilation rate, growth speed weight bases and dry basis etc. But SAU-GROWTH meter measures growth speed of wheat crop plant with most efficient way involving height parameter only in the growth speed of plant (GSP) units.

Background: Parameters and techniques employs for wheat crop growth performance measurement.

Growth is a vital process in plant. This indicates the gradual increase of plant size through its cell elongation (Ting, 1982). Germination, relative growth rate, net assimilation rate and leaf area index are used to measure the growth performance (Naseem *et al.*, 2000). M. S. Alam (2013) used leaf area Index (LAI), crop growth rate (CGR) and relative growth rate (RGR) as parameter to determine growth and reported that wheat crop growth is highly effected by management practices, Increasing nitrogen (N) rates provides significant values of respected parameters and yield were recorded at 160 kg N ha^{-1}.

Growth can be measured in terms of several indices like relative growth rate (RGR), Leaf area ratio (LAR), Leaf weight ratio (LWR), Lead area duration (LAD), Specific lead area (SLA), Specific leaf weight (SLW), Absolute growth rate (AGR), Net assimilation ratio (NAR), Crop growth rate (CGR) etc. These however are not new. These are the ways in which plant growth is measured. (Dr. Santhosh kumar Av Kerala Agricultural University, Thiruvananthapuram), [4] you can use

additional parameters - thickness of upper leaf and number of cells on leaf cross-section; water uptake intensity and transpiration rate; guttation rate (Dr.Vadim Polonskiy, Professor Krasnoyarsk State Agricultural, Krasnoyarsk) [4] .

The present study was initiated to invent the advanced instrument for wheat crop growth speed measurement with most efficiently for better crop management and this invent should be game changing leading to Nobel Prize innovations in the field of science.

Material and Method

Apparatus of SAU-GROWTH meter

1. GSP scale
2. Connecting rod
3. Observation mirror
4. Crop color screen
5. The stand
6. SAU-GROWTH meter working standards

1. GSP scale: GSP (Growth speed of plant) scale is main part of SAU-GROWTH meter, this shows the different values as like a foot scale. There are fixed values of this scale they start from 0 GSP and end at 60 GSP. On this GSP scale the "connecting rod" function on growing plant and touch with the plant tip 'observation mirror" show the value which obtained by a plant, such this process we obtained the initial reading.

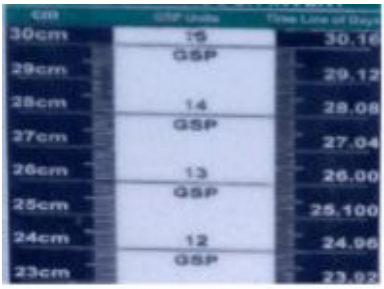


Figure: 1.Showing GSP scale

2. Connecting Rod: The connecting rod connect the growing plant's tip with GSP scale, so GSP of crop plant show at "observation mirror", this functions by moving up and down of connecting rod according to the height of crop plant.

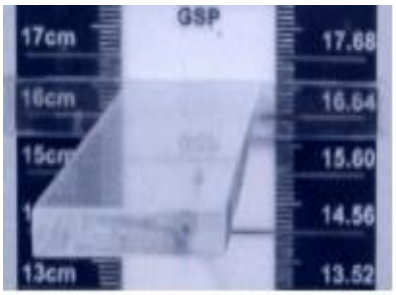


Figure: 2. Showing connecting rod

3. Observation mirror: The observation mirror shows the value of plant at GSP scale. This is noted for further drive at formula. And the height of plant is represented by that value in GSP units.

Figure: 3. Showing connecting rod

4. Crop color screen: This apparatus save the crop history. This contains many colors each color suggest and guide for better crop production according to previous history of crop in which all inputs used and output received. Research department of different countries can recommended crop color to the growers according to their research work, so following the

crop color a farmer can better use resources and can obtained desirable yield.

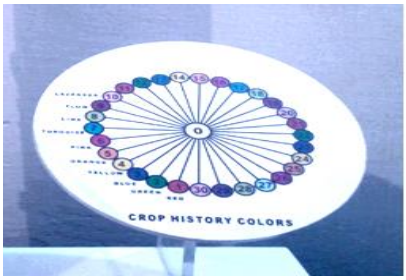
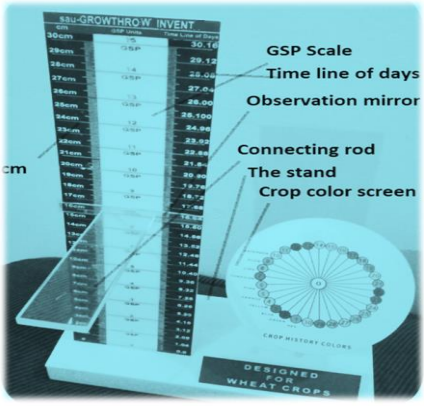


Figure: 4. Showing crop color screen

5. The stand: Meter has a stand which holds the growth meter on land/field when it is used on crop plant.

6. SAU-GROWTH meter working standards: Working standards are main part of meter. Growth speed of plant is finally compared with its standards to know growth of plant is significant or not. Each wheat variety has its own standard GSP (growth speed of plant value) which is fixed by a law. Working standards are made by the formula using ethnical resources. According to the law the growth speed of plant cannot exceed its standard GSP (Growth speed of plant).



Formulas

A formula which divides the height of plant obtained in GSP Units with number of days in which plant grown and multiply to its fixed value provides the Growth speed of wheat crop plant in per second, per minutes, per hour, per day and per month.

$$\frac{{}^{P}\text{GSP obtained by plant}}{\text{No, Days plant grown}} \times 30\ c$$

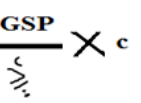
Whereas,

^{P} GSP = Primary GSP obtained by plant

 = Symbol which representing the number of day plant grown

30 c = Constant value

Therefore simply formula can also be written as,



$$\frac{{}^{P}\text{GSP}}{} \times c$$

The formula is easy to use on computer software. A special computer program includes the SAU-GROWTH meter formulas and SAU-GROWTH meter working standard. At their results displayed quick and right. The computer software involves as the meaning of modernization of SAU-GROWTH meter invent.

Formation of Working Standards

Working standards are main part of meter. Growth speed of plant is finally compared with its standards to know growth of plant is significant or not. Each wheat variety has its own standard GSP (growth speed of plant value) which is fixed by a law.

Working standards are made by the formula using ethnical resources. According to the law the growth speed of plant cannot exceed its standard GSP (Growth speed of plant).

$$^{P}\frac{\text{GSP (maturity)}}{\text{No, of days crop maturity}} \times 30\ c$$

Whereas,

^{P} GSP (Maturity) = At crop maturity the height of plant in GSP units divided with No, of days crop maturity and multiply with fixed value.

In this way a standard of wheat variety is made. All new varieties of wheat around the world should analyzed on SAU-GROWTH meter invent, firstly its standard made and included to "SAU-GROWTH METER STANDRADS" chart.

Table 1: Working Standards Chart of Major Wheat Varieties of Sindh, Pakistan

Name of Variety	Date of Release	Plant height (cm)	Days Maturity	Standard GSP/month	Total Std.GSP (Days maturity)
TJ-83	1985	95 = 95	120	11.87	47.48
Mehran-89	1991	100-110 = 105	145	10.86	51.58
Anmol-91	1993	100-105 = 102.5	120	12.81	51.24
Abadgar	1996	100-110 = 105	140	11.25	52.42
Moomal -2002	2002	100-110 = 105	136	11.58	52.45
TD-1	2004	70 = 70	120	8.75	35.00
Imdad-05	2006	85-90 = 87.5	130	10.09	43.68
SKD-1	2006	70 = 70	118	8.09	45.65
Benazir	2013	96 = 96	126	11.42	47.96
Hamal	2013	87 = 87	130	10.03	43.42
Reference: Wheat Research Institute Sakrand Shaheed Benazirabad, Sindh (Variety Release Proposal)					
Sarsabz	1986	109.25 = 109.25	130-135= 132.5	12.36	54.62
Soghat-90	1991	105 = 105	134 = 134	11.75	52.50
Marvi 2000	2002	86 = 86	125 = 125	10.32	43.00
Bhittai	2004	84 = 84	126 = 126	10.00	42.00
Khirman	2004	92-103 = 97.5	123-132= 127.5	11.47	48.75
Sussui	2006	91.5 = 91.5	134 = 134	10.24	45.75
NIA Amber	2010	90-97 = 93.5	119-129=124	11.31	46.75
NIA Saarang	2013	90-105 = 97.5	120-126=123	11.89	48.75
Reference: NIA Tandojam, Sindh (Variety Release Proposal)					

Special Terms

GSP: Growth speed of plant. It is defined as the unit for SAU-GROWTH Meter which is equal to 2 cm.

^{P} **GSP**: Primary GSP is the initial observation obtained from the plant.

^{S} **GSP**: Secondary GSP is the final observation result of plant growth speed.

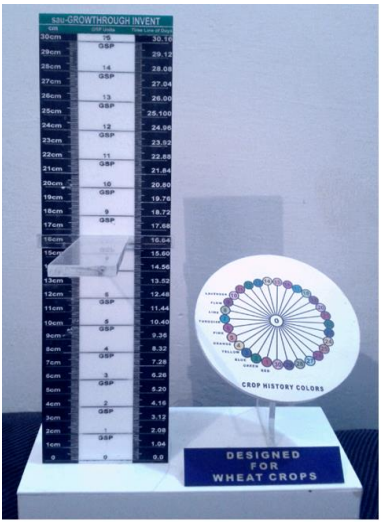
$\sqrt{t}$: Symbol which represents the number of day plant grown.

30 c: Constant value of SAU-GROWTH formula usually denoting the observation taken after each month.

c: Constant, small letter C is used in simplify formula which some time represents the 30 c Constant value.

SAU-GROWTH meter standard chart: It is the chart of varieties' standard values of GSP, used for the Growth performance of plant. The GSP Obtained from plant is finally compared with their standards.

Some Images of SAU-GROWTH METER Model



Results of This Study

A long time research work with limited resources, on growth speed measurement of wheat plant provides us the modern instrument in agriculture field in the form of "SAU-GROWTH

meter". This growth meter is a broad invent in agriculture sector and can prove very much useful in agriculture throughout the world. Now we can measure growth speed of wheat crop plant per second, per minute, per hour, per day and per month as well, which helps us to estimate and maximize yield through proper use of input resources.

CONCLUSION AND SUGGESTIONS

Using SAU-GROWTH meter is very important for wheat crop because of it provides most efficient way for measuring the growth speed of plant in simple form, for better crop production. So, we can well-manage the crop for higher yield.

After invention of this instrument we can use it for agriculture productivity. At this stage work requires encouraging project/resources to made SAU-GROWTH meter for other crops. Hinting up the Samsung, Nokia and other famous companies can be useful for this purpose including Microsoft Corporation. This instrument can be available in small price for farmers and researchers use depending on the project needed to design for its introduction in the market.

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