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Introducing leaf color chart in agriculture of Sindh

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ABSTRACT

Sindh land province of Pakistan is an oldest civilization of the world. Its major economy depends on agriculture. For better crop production, peoples of Sindh use all available resources. They are always interested in new technology from pre-history. Moen-Jo-Dro (Mount of deed, Sindh) peoples were made own instruments for seedbed preparation to harvest crops. This nation was inventory for maximization of crop yield. Remembering ancestors, currently, Sindhi farmers struggling to maximize the crop yield in context with the increasing rate of population, but they are facing a scarcity of agriculture technology due to poverty. They have no good agriculture machinery for better crop cultivation as well as soil analysis laboratories. Students of Sindh Agriculture University always had taken advanced steps to make stronger Sindhi farmer by providing them new modern technology for maximization of crop yield. Funding of this, recently, first time self-made leaf color chart (LCC) is introduced in agriculture of Sindh. Now farmers of Sindh can use LCC for rice to estimate and manage nitrogen deficiency. Deficit of nitrogen cause the nutrient stress which stop or retard plant growth and development, thus directly reduce the yield. Nitrogen deficiency is analyzed by many good methods including LCC becoming famous method because of simple to use. A simple experiment was taken in 2014 to make self LCC and use for rice, wheat, and sugarcane crops in Sindh. This research paper lighting up in detail what is LCC, its uses, and how we made and introduced in agriculture of Sindh.

KEY WORDS: Invent, leaf color chart, nutrient stress, rice crop, Sindh agriculture

LEAF COLOR CHART (LCC)

LCC was first developed by Japan scientists for measurement of chlorophyll availability in rice plant then this found useful for estimation nitrogen deficiency through leaf color observation by easily and non-destructive procedure (Nachimuthu *et al.,* 2007), International Rice Research Institute (IRRI, 1996) reported that LCC provides the accuracy to determine nitrogen deficiency just like chlorophyll meter. It is constructed by the best quality material of plastic usually size of 3 × 8 (Singh *et al.*, 2006). LCC contains six colors yellow-green to lush-green with little change of one by one from first color to last sixth color (Nachimuthu *et al.*, 2007; Sathiya and Ramesh, 2009).

USE OF LCC

LCC is used to asset proper supply of nitrogen fertilizers to crop. This tool helps to estimate and measure nitrogen deficiency within the growing plant through its different colors. LCC is commonly used on rice crop plants but now days this can be used similar structured leaf of different crops such as wheat, sugarcane, etc. [Figure 1], application of nitrogen fertilizer in splits according to requirements of crop maximizes the N utilization efficiency of plant (Sharif, 1994), for that LCC is used in various countries of South Asia and concludes that LCC-based nitrogen management improve rice crop growth and yield. The LCCs used in Asia are about 7 cm wide with 13-20 cm long with four to six colors (Hushmandfar and Kimaro, 2011).

The use of LCC is easy and non-cost full; moreover, a well non-trained farmer can also use (Singh *et al.,* 2010). It is a very quick method (Singh, 2008). Sapute *et al.* (2015) evaluated that the use of LCC is significant; higher dose of nitrogen at higher LCC value had proved good growth and development of plant, while normal spilt dose did not

Figure 1: Mirror made leaf color chart

proved any significant results. The grain yield parameter was found maximum at 5 LCC value by 46.2% increase of yield and 19.9% at 3-4 LCC value. However, overall nitrogen use and its application efficiency were better with LCC-accordance use of N.

USING LCC

Select top most fully developed leaf of the plant and place the leaf on LCC and compare the leaf with colors then note the color and reading. You can use only value as reading. Reading should be taken in the morning time when leaf fully exposed. Repeat this procedure on randomly selected plants (Yosef Tabar, 2013). Select at least 10 disease-free rice plants or hills in a cropped field with uniform plant population and do not damage leaf or plant. Determine and work out average reading of LCC (Bangladesh Rice Knowledge Bank).

Crops that can be Measured at LCC

LCC was made for rice crop and still commonly used on rice crop. Symptom of nitrogen deficiency is disappearance of green leaf color within the plant is similar to all field crops, so LCC can be used all narrow leaf crop plants including rice, wheat, sugarcane, millet, and onion, etc. [Figure 2]. However, LCC can also be used on lower broader leaf crop.

LCC INTRODUCTION IN AGRICULTURE OF SINDH

We initially made 15 LCCs on self-costs in 2014 and distributed freely to Sindhi farmers including field officers of private companies because they cover large agricultural area by providing field advisory services [Figure 3]. Now farmers of Sindh in specific area are getting the advantage of this technology for rice crop. They well-understanding the nitrogen deficiency within crop plant by LCC and applying exact amount of N to the crop. Farmers are using LCC as a quid for better N management because of due to poverty they have no other facility to determine N deficiency. Small numbers of laboratories are available only for research purposes at institutes. They sometimes function for farmers and analysis, but they are very expensive, poor farmer of Sindh cannot afford analysis of soil or plant charges for N deficiency measurement. So LCC for measurement of N deficiency for rice including wheat, sugarcane is becoming famous among Sindhi farmers. They are using LCC and correcting nitrogen deficiency significantly and obtaining maximum yield compared to previous crop yield in which unbalanced fertilizers were used at wrong time applications.

Constructive Step

LCC made by applying simple techniques, we used a mirror; high-efficiency colors, brush, white paper, and aluminum tap as material. The white paper were painted with skill than dried out, that paper were placed down to the mirror and finally sides closed by aluminum tap. In this way, a LCC were produced and successfully used [Figures 1, 2 and 4].

This mirror made LCC is newly named as "Nitrome," here nitro means nitrogen and rom means a room or place where nitrogen deficiency can be determined. This name is selected by a student Shah Jahan Leghari from Department of Agronomy, Sindh Agriculture University (SAU), Tandojam. The constructive finishing of new LCC crossed from high efficiency method and care. The mirror acts as a protective layer as well. This new LCC can be used for several year, its colors do not dim from sunlight.

BENEFITS TO FARMERS USING LLC COLOR CHART

There are many significant advantages to the farmers. They can measure nitrogen deficiency within the crop at field step. They have no need to go laboratories for analysis of nitrogen deficiency. However, the analysis of laboratories is most efficient for measurement of nitrogen deficiency,

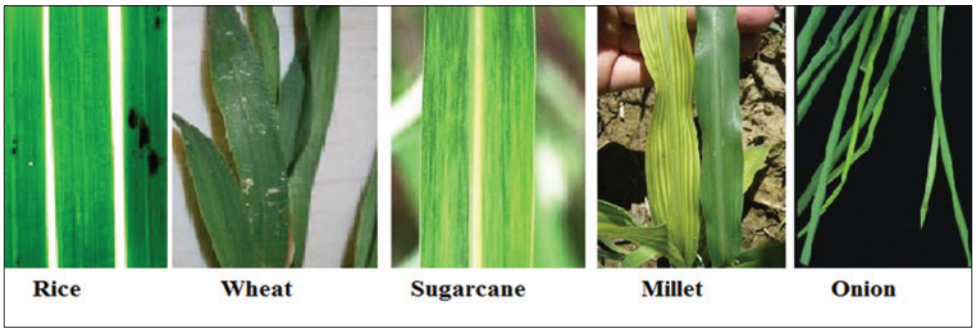

Figure 2: Leaves of various field crops similar to structure

Figure 3: Using leaf color chart, original picture were taken at district Nawabshah, Sindh during 2014

Figure 4: Use leaf color chart on onion crop

Table 1: LCC distributed in various areas of Sindh

Name of farmer	Total holding land (acres)	District	LCC provided (quantity)	Price charged
Ashfaque Laghari	150	Nawabshah	01	Free
Waseem Rahue	500	Hyderabad	01	Free
M. Hanif Mazari	300	Ghotki	01	Free
Khalid Pervaiz	1000	Sanghar	01	Free
Asif Iqbal	60	Nawabshah	01	Free
Amjid Ali Phanwer	90	Dadu	01	Free
Abdul Hafiz	300	Sanghar	01	Free
Noor Muhammad	200	Sanghar	01	Free
Muhammad Hanif Lakho	500	Naushahro Feroze	01	Free
Sadam Dil	100	Larkana	01	Free
Abul Razaq	150	Khairpur	01	Free
Sadam Maher	200	Mirpurkhas	01	Free
Muhammad Bux	100	Badin	01	Free
Khuda Bux Soomro	400	Hyderabad	01	Free
Azizullah Lakho	600	Hyderabad	01	Free

LCC: Leaf color chart

but lab results only understand high qualified agriculturist. Compared to it, LCC is simple to use and cheaper. Farmers simply understand the result with interesting colors and can do better care of crop by preventing nutrient stress. Using of LCC farmer can obtain higher yield through the judicious use of nitrogen fertilizer in rice and many other narrow leaf crops.

CONCLUSION

Nitrogen is a major element. Its deficiency or excessive cause stress which results in lowering the crop yield. Proper use of nitrogen is necessary during crop growth period, for that LCC is a useful tool that guides the farmer when to apply nitrogen fertilizer. LCC is easy to use and inexpensive tool for monitoring and managing nitrogen applications to the field crops. The price of LCC is not more than 1$ Dollar, but availability is an issue still, this is not available in Pakistan market and many other countries as well, so our research studies helping farmers around the world that they can self-made LCC and use it at field step. Further, it can be suggested that the agriculture manufacturing companies play role to manufacture LCC and make available in Pakistani markets, so Sindhi and all over Pakistani farmers can get LCC easily and use commonly for improvement of crop productivity.

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