Decomposition and Nutrient Dynamics on Two Soil Types during Wheat Cropping: A Review

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Abstract

The soil type along with the nutrient inclusion is a critical point for the harvesting of the crop irrespective of the soil quality. The present paper have given the emphasis over the analysis of the soil from the view point of the decomposition of the stable or the residue from the previous harvesting in the field. It has been understood by many experts and agricultural scientist that the decomposition of the residue help to increase the dynamics of the nutrient value and variation in the soil and further, this inclusion of the residue in the soil have increased the fertilizer capacity of the soil and also helps to harvesting the crop organically without the addition of the man made urea based fertilizers. This paper has given a special focus on the field in the north India that have also known as the gangetic plain and this plain is also famous for its harvesting capability as the major part of the India's requirement of the wheat and rice is produced in this field only.

Keywords: Decomposition, Rice residue, Nutrient dynamics, Nylon mesh bag method, Placement method, Soil, Rice, Wheat, Crop.

Introduction

The harvest season system in the Gangetic Plains of Indian terrain, when it produces at around 14 Mha, is rice-wheat (RW) (14 Million Hectares). In this extremely efficient area, massive amounts of rice production residue are generate. The RW crop is rapidly mechanized in the IGP of northwest India and the large proportion of both cereal grains (90 percent) are now cultivated by combinations, leaving the pesticides in the forest [1]. While most of the wheat varieties are removed from of the field and used as animal fodder, before the replacement wheat is sown, several residue compounds are burned in the field.

Organizing agro forestry systems is a crucial aspect of urban crop systems and may have received a great lot of attention in recent years as a way of raising the productivity of soil organic matter as well as nutrient availability, minimizing the adverse belongings of residual aflame. In situ penetration, intercropping with minimal to no tillage and elimination are the primary remains management techniques. As an alternative to replace in northwest India, the inclusion of recipes contain was recommended 15 to 25 days before wheat seeding.

Assimilation, however, requires many tillage procedures that raise the demand of cultivation in addition to delay wheat seed production due to small harvest periods. The region of zero-tilled wheat production increased significantly since the late 1990s due to significant cost reductions due to reduced fuel and labor use, after absolute or partial burning of recipes contain in the gangetic plain.

However, due to cultivation obstacles in the movable residues, and (ii) non uniform fertilization depth associated with prolonged drill elevations to clear blockages, specific grinding of wheat into rice residues may not have been possible. Instead of integrating and burning, latest machinery developments (Happy Seeder) for at the same time bark mulch rice residue when sow wheat provide the possibility of ground rice residue.

Compared to absorption, mulching rice residues is much less probable to consequence in N control, but may also give non-N advantages such as surface protection, water resistance or weed repression. Nutrient liberation is prime step in a process that converts kinds of chemicals residue into mineral soils [2]. Environmental conditions and leftover biological composition influence decomposed levels and fertilizer leakage. Loam soil prevents oxidation by offering some degree of "security" by trying to associate organic materials with cement paste and affecting the soil's physiological and chemical structure.

Soil microenvironments differ in surface position for plant photosynthesis than in integrated residue, thus affecting the nature in addition to extent of natural substance dynamics as well as nutrient cycle. Several researchers have researched the evaporation of harvest residues in dissimilar circumstances. Degree-days are used to adjust for the effects of temperature as well as predict mineralization in C. The benefit of the move toward is that it makes it possible to conduct comparisons of obtained from laboratory studies at different sites throughout years.

Furthermore, since cumulative DGD is widely implemented in forecast crop growth, it is a high-quality technique for matching soil in addition to crop process and analyzes the synchrony sandwiched between N release residues in addition to N uptake. Even though the belongings of assignment on the disintegration of dissimilar residue other than rice are recognized [3], there is a lack of knowledge in the rice as well as wheat organization, the important cropping scheme in the world. There is definite require to research the disintegration in addition to nutrient dynamics in different rice/wheat soils as a function of DGD.This knowledge would help to establish an accurate nutrient management composition.

METHODOLOGY

- *Site Description:*

The experiment has been done on the wheat and rice soil categories that include the sandy and silt loam type of the soil and the data has been taking continuously for two year. The two year duration for collection of the data has been finalized before the start of the experiment. The duration has included the wheat season and rice season to collect the data. For the collection of the data two sites have been identified as first site is located in the Haryana and second site is located in Punjab [4]. The types of the sand identified for the experiment is suitable for the production of the rice and wheat. The climate of the region described by the metrological department is sub tropical and semi arid. The data of the soil temperature in varied weather has been noted down along with the measurement of the precipitation.

- *Residue Decomposition And Nutrient Release:*

The research was recognized in winter preceding the crop of rice as the first harvest. After wheat harvesting, residues of all the parcels were gathered. The parcels were 10 metres long and 3.6 m wide. Wheat was cultivated between 10-15 Novembers just after farming season in the first week of October. An active experimental study involving multiple tillage-residue management and N manure procedures was used for the evaluation of residue decarboxylation and nutrient release. Four irrigations at 21-24, 54-60, 106-110 and 126-135 day after sow were given to wheat during the study period.

To research the kinetics of residual decomposition as well as the recent removal of N, and K release, a plastic net bag methodology was used. Nylon bags comprising rice residue were tested 7 times during the wheat planting season. After the grain was sown, seven sealed plastic mesh bags (one for each of the seven samples) were mounted directly on the soil surface and seven bags in each status change at a depth of 10-12 cm. The location of each ziploc baggie was labeled with a nylon thread attached to a leather strap. For each of the seven samplings a nylon mesh bag of every plot have been extract arbitrarily at frequent intervals.Residue outstanding on every sample date was uninvolved after the container, gently surprised over a sieve to extract the bulk of soil and eventually eroded away with distill water closely. At 60° C for 48 hours, samples were then oven-dried, weigh and grounded to move through a \1 mm sieve.

Calculations And Statistical Analysis:

The research was established in winter preceding the crop of rice as the primary crop. Just after wheat harvesting, remains of all the parcels were gathered. The parcels were 10 metres long and 3.6 m wide. Wheat was cultivated between 10-15 Novembers just after farming season in the first week of October. An active experimental study involving multiple tillage-residue management and N fertiliser procedures have been using for the evaluation of residue decarboxylation and nutrient issue [5]. Program wheat plans fertilized with no tillage (shallow residue) as well as conventional tillage (buried residue) procedures were chosen for the present research. Four irrigations at 22-25, 56-62, 106-111 and 124-132 days after sowing were given to wheat during the study period.

The principal component of soil organic substance is SOC (SOM). As an indicator for soil physical condition, the SOC is important in terms of its contribution to agricultural production, climate change mitigation and the achievement of the goals of sustainable development. A high SOM content provides plants with nutrients and increases the availability of water, both of which increase soil fertility and eventually improves the productivity of food [6]. In addition, by encouraging conformational changes, SOC enhances soil structural stability, which, mutually along with porosity, ensures sufficient aeration and moisture retention to sustain crop production.

The most valuable form of soil organic carbon may be SOM, but it is usually the least durable, although some types may last for a thousand years or more. In the presence of oxygen, several types can be readily oxidised (turned into greenhouse gases) by pathogenic diseases. However, it is also the form of soil carbon that can easily increase due to plant growth, perennial grass root shedding, the absorption of manure or compost, plant root liquid carbohydrate exudates, all mediated by microbial metabolic rates. The most abundant source of soil organic carbon is soil organic matter.

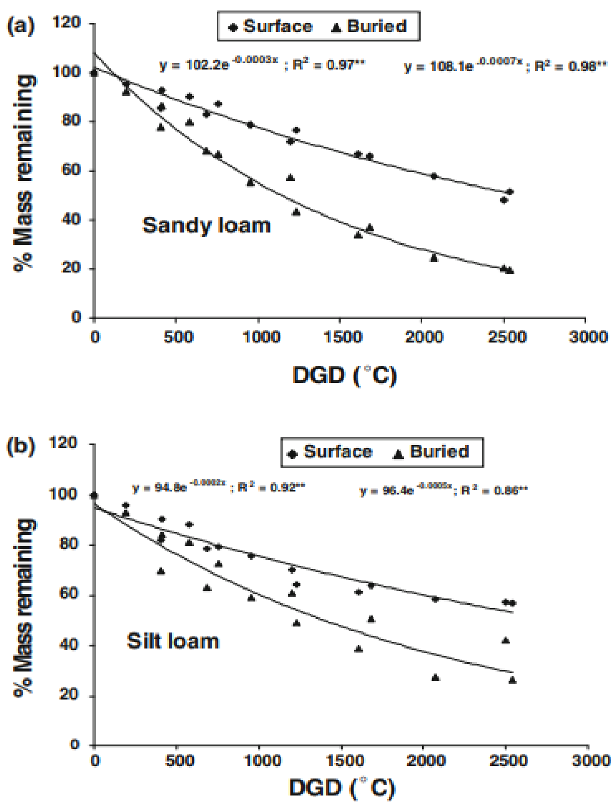

Fig. 1: Rice Residue Mass Remaining throughout the Decomposition Cycle as a Function of Degree-Days (DGD) as Affected by Method of Placement in Two Soils

RESULT AND DISCUSSION

Rice Residue Decomposition:

The way of breakdown as calculated by loss of biomass has defined by the time-exponential technique in soils with standards of R2 ranging from 0.94 to 96 as in Fig. 2. Failure during the first 404 DGD was rapid follow by a measured rate of refuse in soils. The original rapid decrease represents carbohydrates, proteins and other readily decomposable substances. On the additional hand, the resulting gentler rate of disintegration may be due to additional recalcitrant portion which microbes do not effortlessly strike. Use exponential form with temporal level as DGD correlates our residue decomposition test[7].

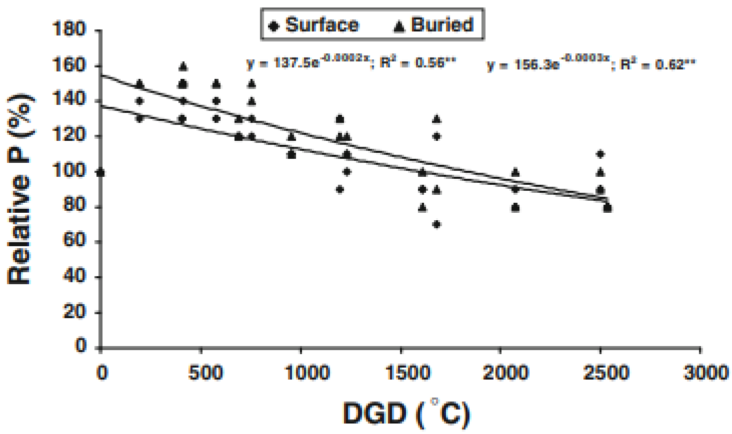

Fig. 2: Relative P Concentration in Rice Residue throughout the Decomposition Cycle as a Function of Degree-Days (Dgd) as Affected by Method of Placement in Two Solis

The decomposition levels obtained in this study for the surface-placed rice residue are very close to those reported by other authors. It is recorded for rice, wheat, and oat, for example. These functions could be use to forecast the quantity of rice stable left over under either the non-limiting soil wetness (irrigated) as well as encouraging temperature circumstances of northwestern India throughout wheat growth at a particular stage [8].

Decomposition occurred significantly impacted by residue placement process, form of soil and time. At the conclusion of the decomposition process, the covered rice residue lost about 85 per cent of its original mass, resulting in a decomposition rate (k) of which was around 2.5- times as quick as that in the surface residue[9].

Nutrient Composition:

The content of nitrogen and K in rice residues was significantly influenced by placement methods, soil type and time. However, the positioning approach did not display any important impact on the P content in rice residue as mentioned in Table 1. Exponential model with substantial R2 varying from 0.79 to 0.82 defined the pattern of comparative N augment in the rice remains in soils. Such findings are with the other researchers in agreement. In addition to increased carbon release (although not explicitly measured), as is obvious from significant loss, an increase in residue quantity may also be due to rapid leaching of many other non-nitrogen compound. A further mechanism involved in N immobilization can be fungal translocation. In rice remains, the exponential function of percent P had R2 0.57–0.63 which was inferior than N. nothing like N, P continuously decline to 73 and 85 percent below the early buried and exterior residue, but was not compatible with the investigational data indicating that function were not a proper match. Rice residue increases of P percentage throughout the initial four weeks of disintegration were recorded[10].

Table 1: Values for % Mass Remaining of Rice Residue

Source of variation	*df*	Mass remaining (%)	N (%)	P (%)	K (%)
2004–2005					
Sandy loam					
Placement	1	680.5**	134.3**	6.2NS	673.6**
Time	6	286.1**	87.1**	32.9**	971.2**
Placement × time	6	58.8**	3.14*	27.5**	147.0**
Silt loam					
Placement	1	680.5**	121.2**	12.7NS	403.6**
Time	6	286.1**	69.1**	12.8*	883.2**
Placement × time	6	58.8**	22.1*	4.5**	81.0**
2005–2006					
Sandy loam					
Placement	1	1764.3**	105.9**	4.10 Ns	30.2*
Time	6	337.9**	72.6**	59.8*	1074.0**
Placement × time	6	46.1**	4.18 NS	2.37NS	5.08**
Silt loam					
Placement	1	1927.4**	82.9*	3.70 NS	28.8*
Time	6	237.9**	112.6**	50.8*	1674.0**
Placement × time	6	34.4**	3.72 NS	2.09NS	5.08**

Where $* P < 0.05$; $** P < 0.01$

CONCLUSION

The conclusion part of the paper may summarize in term of the probability of the concentration of the N, K and P residue in the soil. The residue of the different harvested produced slowly decomposed and mixed with the soil and increases the soil fertilizer capacity without using the artificial method that included the scattering the man made fertilizers ij the field, apart from this the benefit of the genetic plain is also help to increase the soil quality as many minerals have flown with the river in the plain of the north India and the plain of the north India have been considered best filed for the production of the wheat , rice and other crops that required the greater moisture in the soil during the harvesting period .

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