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UTILIZATION OF NATURAL RESOURCES FOR INCREASE CROP PRODUCTION

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ABSTRACT

Pakistan has Predominant agrarian economic posture. God has blessed us with abundant wealth of natural resources and if utilized properly, it can enable our agriculture to produce much more food, than the present. Studies have shown that Pakistan's low rank coal have sizeable amounts of Humic acid (HA), which can be utilized in agriculture as an organic manure. In the present paper, research on the potential benefits for increase agriculture production has been discussed. The study corroborated that application of HA enhanced availability of plant nutrients and concomitant increase in yield and yield components of maize crop. This mysterial material "The Cell of Creation" (Qur'-an 23-12) not only act as multi-nutrient pool, but also make the soil environment more conducive for enzymatic activities which antagonize root diseases. It can be advocated that the cumulative effect would be far better than both, direct and residual on soil physical, chemical and biological properties and thus agricultural production. Since it is used in very low concentration (0.0007-0.002%), locally available in abundance and is therefore very cheap and can play important role in the economics prosperity of Pakistan.

Keywords: natural resources, humic acid, crop production, organic manure, maize, yield.

INTRODUCTION

Agriculture is the main stay of Pakistan economy. It accounts for 25 % of GDP, employs more than 50% of the total labour force, supports 68% of the population sustenance, contributes more than 90% of foreign exchange earnings. The average yield per acre of major crops, at present is far below than "actual production potential", which provide tremendous scope for increased output. Attempts to achieve a revolutionary increase in food production through synthetic agrochemicals are likely to have unforseen repercussions. It almost took four decades to understand that these synthetic agro-chemicals are poisoning the soil in the long run and as such intervene soil health or the farmers (Racheal Carson, 1962). The alternative is non-chemical intervention.

Nature has been quite generous in providing Pakistan with modest resources and if utilized/exploited properly, it can enable our agriculture to produce much more food than the present. It is human failing not to make the best use of these resources. The Quran (Qur'-an 7:31) has very specific injunctions against wasting resources.

Today the scientific advancement and technological achievements have made man restive to go back to the nature again and not overstep the limits of nature. It is high time that the soil and its resources are treated according to divine revelations. According to Al-Quran "Soil is not an inert mass (dead), but is a living entity (Qur'-an 50:11, 43:11, 7:58). The significance of certain verses is astonishing. For example, the Insan (human being) was created from Black-mud, altered and capable of fermentation (Qur'-an 23:12). The black-mud would be some higher compound of carbon. In conditions of partial anoxia a mud is accumulated, while oxic processes through organic matter mineralization result in the formation of Black-mud. The other quality of this Black-mud was that it could ferment. Fermentation, whether caused by the metabolism of bacteria or enzymes, are of vital importance in agricultural processes. Without their agency in breaking up organic matter, the soil would rapidly become an inert mass. The "Black-mud" describe the dark-colored material (Saussure, 1802) was designated as Humic Acid (HA) by Dobereiner (1822).

The utilization of Humic acid which is abundant in Pakistan lignitic coal can be made effectively to boost up agriculture production. Unfortunately, so for no research study has been carried out on its agricultural aspects and information in this regard are very limited. The present study was conducted as a challenge to a country like ours and it remain to be seen whether we accept the alternative to switch over to the use of indigenous less expensive natural resources.

MATERIALS AND METHODS

A field experiment on maize was conducted on alkaline calcareous soil, using RCB design consisting of eight treatments, replicated four times. Humic acid (HA) @ 200 gms ha^{-1} and P_2O_5 @ 0, 50, 100 and 150 kg ha^{-1} as Single Super Phosphate (SSP) was applied. The level of N and K applied was equivalent to 100 and 70 kg ha^{-1}, respectively. The data on number of ears, weight of ears and stalk were recorded from net plot of 5 m x 5m. Grain yield was calculated on per hectare basis. Organic-C (Jackson, 1958), bicarbonate-P (John, 1970), $CaCO_3$ (Black, 1965), C-minerlization (Incubation tech. Of Jenkinson and Powlson, 1976), P-mineralization (incubation), P-adsorption (equilibration), adsorption maxima (L. isotherm) were determined before and after HA application. The data was statistically analyzed according to Snedecor (1962).

RESULTS AND DISCUSSION

Soil Differences:

Some major differences were found in chemical and biological properties (Table-1) between the HA treated and untreated soil. There was an overall increase in organic-C and extractable-P. Several possibilities may be presumed about the source of both organic-C and available phosphorus. Humic acid it-self contain both organic-C and P which might have released on mineralization. HA induce P-immobilization on reinforcement with P during incubation. This contention was corroborated by decrease in maize yield due to HA reinforcement with P fertilizers. HA also contain micronutrients and there is a possibility of chemical precipitation of some of the micronutrient with the native and applied-P.

Table-1. Physico-chemical characteristics of the soil, before and after HA application.

	pH	Organic Matter	$CaCO_3$ %	ECe dSm^{-1}	P_2O_5 $\mu g\ g^{-1}$	Texture
Before	8.1	0.30	22.9	0.21	8.0	Silty clay loam
After	8.5*	0.73	23.4	0.22	9.3	Silty clay loam

* Mean of Humic acid replicates.

Crop yield:

The most striking and encouraging point was the significant increase in the yield and yield component of maize crop. Humic applied @ 200 g ha^{-1} increased the grain yield from 125 to 2690 kg ha^{-1} and all other yield component together with P-uptake. HA applied alone was comparable with all P levels (50, 100, 150 kg ha^{-1}) applied alone (Table-2).

Table-2. Effect of single super phosphate applied alone in reinforced with Humic acid on grain and stalk yield of maize.

P	H.A	Grain	Stalk
kg ha^{-1}	g ha^{-1}	kg ha^{-1}	
0	0	1425 B*	6875 D
50	0	2500 A	10630 AB
100	0	2875 A	11750 A
150	0	2750 A	10980 A
0	200	2690 A	10800 A
50	200	2250 AB	10380 ABC
100	200	2250 AB	8125 BCD
150	200	2000 AB	7875 CD
LSD (5%)		1072	2562

* Values followed by same letters are not significantly different from each other at 5 % level of probability.

Table-3. Seasonal soil respiratory activity (mean values kg ha^{-1} $year^{-1}$).

S. No.	Soils/Country	CO_2 Evolution kg ha^{-1} $year^{-1}$
1	Malaysia-tropical forest	52,100
2	Japan, temporate forest	39,050
3	Japan, mountain forest	25,200
4	Canada, silty loam	12,800
5	Germany, sandy loess	11,100
6	England	10,100
7	Pakistan (NWFP), silty loam	7,682+/9,942*
8	Scotland, mine soils	6,409

\+ Before * After HA application

CONCLUSION

To conclude, the effect of HA applied alone was more effective in making soil environment conducive for plant nutrients availability and contribute to available nutrient pool, continuously releasing plant nutrients with time. Biological activities induce by HA antagonize root diseases and improve soil physical properties. The effect of HA on seed germination and resurrection of dead shrubs (background study) support that among the many applications of HA, its soil conditioning and hormones like activity (Henis, 1996) is of particular interest for agricultural purposes. Applied-P binding by HA can result in mobilization of soil P reserves for the subsequent crop. Therefore, in addition to current increase in crop yield, it can have long lasting residual effect on subsequent crop. It has been noted that the residual effect of organic amendments are more than the direct, while the cumulative effect is far more than both, the direct and residual (Hajra and Debnath, 1979).

Economics of inorganic fertilizer is primarily governed by the cost of fertilizers and value of produced obtained. The increase price of fertilizers has not only affected the farmer income, but also the Government. For example, the local production of P fertilizer only meet 25% of our P requirements, 75% is imported involving huge amount of foreign exchange.

RECOMMENDATIONS

Keeping in view the limited resources of both farmers and Government, on one hand and the miraculous properties, function, economics, and to sustain continuously increasing crop production goal and to unlock the doors towards “Self- Reliance” in Agriculture, on the other hand there is only one but good option, to exploit and utilize this God gifted natural resource bestowed upon us, properly and efficiently. It should not be left as such after coal-mining as for burning as a fuel to check environmental pollution and nutrient losses.

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