Global Scientific JOURNALS

GSJ: Volume 11, Issue 8, August 2023, Online: ISSN 2320-9186

www.globalscientificjournal.com

Assessing Impact of different NP levels and Organic Fertilizers on wheat crop productivity

Muhammad Kashif[1], Mansoor Javed[1], Waseem Ur Rahman[1], Arshad Alam[1], Salman Abas[1]

[1] Department of Agronomy The University Of Agriculture Peshawar Pakistan

Corresponding author e-mail: mansoor92@aup.edu.pk

Abstract

A field trail entitled with "Assessing impact of various NP levels and Organic fertilizers on wheat crop productivity" was conducted at Agronomy Research Farm of The University of Agriculture, Peshawar during the Rabi Season of 2021-2022. The aim of this research was to examine how different levels of NP in combination with organic fertilizer impact wheat yield. To ensure accurate results, the experimental trial was set up using a (RCBD) with a split plot arrangement. The trial included four replications to enhance the reliability of the findings. Different Inorganic NP levels of 90:60, 110:80, 130:100, 150:120, and 170:140 kg/ha were applied at sowing time, with nitrogen being split into two doses, half at sowing and the remaining at the first irrigation. Different organic fertilizers, including 1.26 liters ha^{-1} of maxicrop sea gold sprayed after emergence, 6 tons ha^{-1} of poultry manure and 11 tons ha^{-1} of farmyard manure applied before sowing. The highest recorded values for, spike length (12.1 cm), productive tillers (268 m^{-2}), 1000 grain weight (47.6 g), grains per spike (54.2), and biological yield (10450 kg/ha^{-1}) were obtained with the application of 6 tons ha^{-1} of poultry manure. Similarly, the highest values for productive tillers (285 m^{-2}), spike length (11.9 cm), grains per spike (55.9), 1000 grain weight (50.8 g), and biological yield (11103 kg/ha^{-1}) were observed with an NP ratio of 130:100 kg ha^{-1}.The study found that there was a significant interaction between NP levels and organic fertilizers, which had a notable impact on several parameters, such as productive tillers, grains per spike, spike length, thousand grain weight, and biological yield. Based on the experimental results, it can be concluded that the most effective combination for promoting the growth and yield of wheat was the application of NP at a ratio of 130:100 kg ha^{-1} in conjunction with poultry manure at a rate of 6 tons ha^{-1}.

Key Words: Wheat crop, NP levels, Organic fertilizer

1. INTRODUCTION

King of cereal "wheat (Triticum aestivum L)" has been grown for many years. Approximately 10,000 years B.C. during the Neolithic era, wheat was domesticated and it remains a vital crop on a global scale. In wheat production Pakistan ranks 6th position worldwide and referred a staple food in Pakistan. Wheat was cultivated on 9.2 million hectares area resulting 27.5 million tons production during the 2021-2022 cropping season (PBS, 2021-22). Wheat crop contributes 9.2% of the value added in the agricultural sector and 1.8% to Pakistan's Gross Domestic Product (Khan *et al.,* 2022).

The constant removal of nutrients from the soil as a result of intensive crop cultivation causes a decrease in soil fertility. If these nutrients are not adequately replaced, it creates an unfavorable environment in the soil. This type of stress is prevalent in agricultural lands throughout the region and has adverse effects on crop production (Ahmad, 2002). It is imperative to ensure a well-balanced supply of essential nutrients in order to enhance crop yields in Pakistan. The intensive cropping system in place has led to significant depletion of crucial elements from agricultural lands, leading to a decline in soil fertility (Singh, 2012).

Future agriculture and development face several major challenges, including the adaptation and mitigation strategies for climate change, fulfilling the food requirement of the growing global population, and the reduction of environmental hazards associated with various agricultural technologies and practices (Migliorini and Wezel, 2017). In modern agricultural practices, technology plays an important role in combination with precise farming, mechanization, and chemical fertilizers being increasingly utilized. However, we must take into account the detrimental effects that these practices can have on both the environment and the overall health of the soil. Synthetic fertilizers have a higher nutrient content compared to organic fertilizers (Ahmed *et al.,* 2017; Laird *et al.*, 2010). However, their use poses increased risks of environmental pollution and soil degradation. Under changing climatic condition synthetic fertilizers is particularly important for enhancing wheat yield and productivity (Hochman and Horan, 2018; Ghafoor *et al.,* 2022). However, sole use of synthetic fertilizers leads to a decrease in soil productivity and subsequently lowers crop yield. Soil fertility and wheat yield can be improved by the use of synthetic fertilizer but higher temperatures and lower soil organic matter reduces their effectiveness making their combined application with farmyard manure, poultry manure, and biochar a more cost-effective approach (Iqbal *et al.,* 2012; Su *et al*., 2006). Different Studies have demonstrated that the application of chemical fertilizers, including Nitrogen, NP, and NPK, independently affects the concentration of soil organic carbon (Iqbal *et al.* 2012; Su *et al.,* 2006). Conversely, the use of mineral fertilizer in conjunction with agricultural manures significantly enhances various soil properties (Dheri *et al.,* 2021). Furthermore, the average value of soil organic carbon is reduced by approximately 18% compared to the baseline value (Su *et al.,* 2006).

Organic fertilizers including Farm yard manure, poultry manure, compost plays an essential role in reducing the reliance on chemical fertilizers and promoting sustainable agriculture practices. By utilizing organic systems, we can enhance biodiversity, improve ecosystem health, and support natural cycles and biological activity in the soil. In less-polluted ecosystems like deserts, the use of organic fertilizers offers a promising approach to minimize the use of synthetic fertilizers, especially thereby reducing agricultural costs. Moreover, organic fertilizers provide essential nutrients and beneficial substances to crops, resulting in improved growth, development, and higher yields, as demonstrated in studies conducted on wheat crops (Tawfik *et al.,* 2005).

In modern agriculture the unbalanced and continuous use of mineral fertilizers has resulted in a decline in soil fertility and productivity due to a reduction in nutrients within the soil solution, leading to harmful consequences (Alessandrino *et al.,* 2021). Using too much of either inorganic or organic fertilizers, can have both positive and negative consequences on plant growth, the availability of nutrients, and the overall health of the soil. Organic fertilizers are relatively low in nutrient content but they can enhance the physical and biological activities of the soil, requiring in larger quantities for proper plant growth and development (Cen *et al.,* 2020). Additionally, they are slow release fertilizer to be available to plants (Yang and Ha, 2013). On the other hand, inorganic fertilizers contain all the necessary nutrients that are readily accessible to plants and provide immediate use. However, the persistent utilization of inorganic fertilizers alone leads to deterioration of soil organic matter content, soil acidity, and environmental pollution (Alessandrino *et al.,* 2021). Hence, embracing a sustainable approach that combines synthetic fertilizers and organic manures in suitable ratios can bring advantages in terms of better crop yields and enhanced soil quality (Randhawa *et al.,* 2012). Relying solely on inorganic fertilizers while neglecting organic inputs in intensive cropping systems results in depleted soil health and suboptimal crop productivity (Kopittke *et al.,* 2019). Furthermore, excessive usage of chemical fertilizers leads to groundwater contamination (Srivastav, 2020; Busico *et al.,* 2019). By combining organic manure with chemical fertilizers, it is possible to positively impact soil fertility status and enhance crop productivity (Iqbal *et al.,* 2019). Integrated nutrient management allows for a gradual increase in soil organic matter, although it may take several years. However, its long-term and sustainable contribution to boosting production is significant (Abid *et al.,* 2020). Moreover, the primary goal is to maintain soil fertility and ensure an optimal supply of plant nutrients by maximizing the benefits from all available sources in an integrated manner (Ahmad *et al.,* 2022).

Keeping in view the importance of nutrient management the current study was conducted to discover the optimal approach to manage both organic and inorganic fertilizers in order to meet the growing population's food demand on a sustainable basis.

2. MATERIALS AND METHODS

A research study entitled "Assessing impact of different NP levels and Organic fertilizers on wheat crop productivity" was conducted during Rabi season 2021-2022 at Agronomy Research Farm of the University of Agriculture Peshawar. The research site is located in Peshawar Valley, specifically at coordinates 34° N latitude and 71.3° E longitude, with an elevation of 350 meters above sea level. Peshawar has a continental climate and is situated around 1600 km north of India. Water for irrigation purposes is supplied to the experimental farm through the Warsak Canal, which draws water from the Kabul River. The experimental trail was carried out using Randomized Complete Block Design (RCBD) with a split plot arrangement, having four replications. The experiment comprised two factors: the primary factor in the main plot including different organic fertilizers sources (Farmyard manure at a rate of 11 t ha^{-1}, poultry manure at a rate of 6 t ha^{-1}, and maxicrop sea gold at a rate of 1.26 L ha^{-1}), while the sub plot factor consisted of different nitrogen and phosphorus (NP) levels (90:60, 110:80, 130:100, 150:120, and 170:140 kg ha^{-1}).Before experiment a pre harvest soil sample were taken and analyzed for various soil factor. Data were recorded on number of productive tiller m^{-2}, spike length, number of grains $spike^{-1}$, Thousand grain weight, biological yield and Grain yield.

The experiment employed various main and sub plot factors, and the specific details of treatments are outlined below.

Main plot factor (Organic fertilizers)

1. Poultry Manure (PM) applied at a rate of 6 tons per hectare
2. Farmyard Manure (FYM) applied at a rate of 11 tons per hectare
3. Maxi crop sea Gold (MCG) applied at a rate of 1.26 tons per hectare

Sub-plot factor (Nitrogen and Phosphorus (NP) levels)

Treatment1: Control (no additional NP)

Treatment2: 90:60

Treatment3: 110:80

Treatment4: 130:100

Treatment5: 150:120

Treatment6: 170:140

Table 1. Pre harvest soil sample analysis for various soil properties.

Soil Properties	Values	Unit
Nitrogen content	0.11	%
Phosphorus content	4.53	mg kg^{-1}
potassium content	70.3	mg kg^{-1}
Organic matter	1.54	%
Soil pH	8.68	
Electrical Conductivity	0.09	dSm^{-1}

3. RESULT AND DISCUSSION

Productive tillers m^{-2}

The data for the number of productive tillers per square meter (tillers/m^2) is displayed in (Table 2). The results clearly indicated the significant impact of organic fertilizers and different levels of NP (nitrogen and phosphorus) on the quantity of productive tillers m^{-2}. The highest number of Productive tillers m^{-2} (285), were noted in plots that received NP at ratio of 130:100, while the control group had a lower count of 237 tillers. These findings are consistent with the conclusions drawn by (Nethra *et al.,* 1999; Hyder *et al.* 2021), who stated that a balanced application of NP fertilizers can increase the number of productive tillers m^{-2}. Among the organic fertilizers used, those plots treated with poultry manure resulted in the highest count of productive tillers m^{-2} (268), followed by Maxicrop sea gold (260), while the plots treated with farmyard manure had the lowest count (251). According to a study conducted by (Chand *et al.*, 2006 and Ali *et al*., 2022), it has been found that when organic and mineral fertilizers are used together, they have a positive impact on the ability of wheat plants to produce more tillers m^{-2}. This means that the combined application of these fertilizers helps in promoting the growth of additional shoots from the main stem of the wheat plant. Although this approach requires a substantial amount of energy and financial resources, the combination of natural and synthetic nutrient sources not only provides the necessary elements but also established positive correlations that improved efficiency and address environmental concerns. Similar finding were also reported by (Bhardwaj *et al.,* 2019; Hafiz *et al.,* 2011) showing that the application of different organic and inorganic fertilizers led to a higher number of productive tillers per square meter (tillers/m^2) in comparison to the control group. Significant results were observed from the interaction between organic fertilizers and NP levels (Fig 1). The results clearly demonstrated that the utilization of both organic and inorganic fertilizers (NP) had a positive impact on increasing the number of productive tillers per square meter (tillers/m^2).

Table 2. Different NP levels and Organic fertilizers effect on Productive tillers m^{-2}

	NP levels (Kg ha^{-1})						
Organic fertilizer	CONTROL	(N-P) 90:60	(N-P) 110:80	(N-P) 130:100	(N-P) 150:120	(N-P) 170:140	MEANS
FYM	235.8	240	245.5	275.8	266.0	244.8	251.3 c
PM	234.3	259.3	267.3	294.5	280.3	272.5	268.0 a
MSG	242.8	247.5	260.3	285.8	277.5	250.8	260.8 b
MEANS	237.6 e	248.9 d	257.7 c	285.3 a	274.6 b	256.0 c	

Farm Yard Manure (FYM), Poultry Manure (PM), and MaxiCrop Sea Gold (MSG).
Least Significant Differences value for Organic fertilizer at 5% probability = 1.44906
Least Significant Differences for (N-P) at 5% probability = 4.64323
Least Significant Differences for Interaction at 5% probability = 8.0424
Mean values within the same category that are denoted by different letters indicate a significant difference from each other at a 5% level of probability, as determined by the LSD (Least Significant Difference) test.

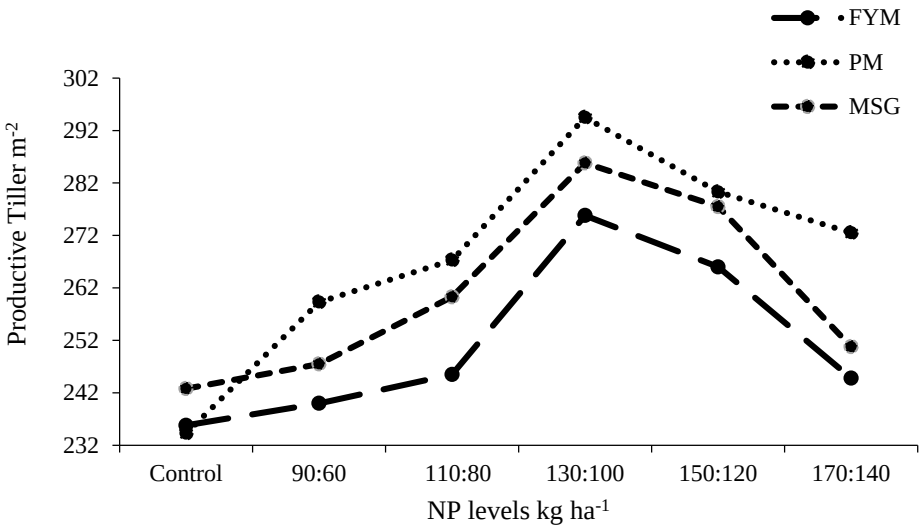

Figure 1. Combine effect of organic fertilizers and NP levels for productive tiller m^{-2}

Spike length (cm)

Organic fertilizers and NP levels significantly effected spike length (Table 3). Highest spike (13.53 cm) were recorded in plots treated with NP at ratio of 130:100, indicating the importance of achieving an optimal balance of nitrogen and phosphorus for spike development. In contrast, the control plots exhibited lower spike length of 10.7 cm that did not received any additional fertilizers. Study conducted by (Iqbal *et al.,* 2021) explored the impact of NP ratios on crop growth and emphasized the significance of maintaining a proper balance of nitrogen and phosphorus for maximizing spike length. Their findings indicated that higher NP ratios led to increased nutrient uptake, improved plant growth, and ultimately contributed to longer spike length. Comparing the effect of different organic fertilizers, it was observed that the use of poultry manure resulted in the maximum spike length of 12.1 cm. Our result are in line with earlier studies conducted by (Rasul *et al.,* 2015) supported the notion that organic fertilizers, including poultry manure, enhanced plant growth and yield when compared to the use of chemical fertilizers alone. (Pedro *et al.,* 2011) found that the application of poultry manure and NP fertilizers increased wheat grain yield through the promotion of tiller and grain development. Furthermore, (Masoni *et al.,* 2007), reported the presence of organic matter and nutrient content in poultry manure, that can improve soil fertility and nutrient availability, thus contributing to better spike development. Interactive response of poultry manure and different NP levels were also found significant (Fig.2). Increasing NP levels upto 130:100 along with poultry manure produced larger spike length. Multiple research studies have provided confirmation that the implementation of integrated nutrient management has significantly enhanced crop growth. This positive impact can be attributed to the improved and easily accessible availability of essential nutrients for the plants (Darjee *et al.,* 2022; Kumar *et al.,* 2023). This suggested that the impact of organic fertilizers on spike length may be influenced by the nitrogen and phosphorus levels provided by NP fertilizers. Therefore, a specific combination of organic fertilizer and NP ratio can potentially have a synergistic effect on spike development.

Table 3. Different NP levels and organic fertilizers effect on Spike length (cm).

	NP levels (Kg ha^{-1})						
Organic fertilizer	CONTROL	(N-P) 90:60	(N-P) 110:80	(N-P) 130:100	(N-P) 150:120	(N-P) 170:140	MEANS
FYM	10.5	10.8	10.8	12. 0	12. 0	10.3	11. 06c
PM	10.8	11.5	12. 0	13.8	13. 0	11.8	12.1a

MSG	10.8	12.5	13. 0`	14.8	14. 0	12.8	11.6ab
MEANS	10.7e	12.5c	13. 0b	13.53a	13. 0b	13.6d	

Farm Yard Manure (FYM), Poultry Manure (PM), and MaxiCrop Sea Gold (MSG).
Least Significant Differences value for Organic fertilizer at 5% level of probability = 0.65647
Least Significant Differences value for (N-P) level at 5% level of probability = 0.45177
Least Significant Differences value for Interaction at 5% level of probability = 0.78247
Mean values within the same category that are denoted by different letters indicate a significant difference from each other at a 5% level of probability, as determined by the LSD (Least Significant Difference) test.

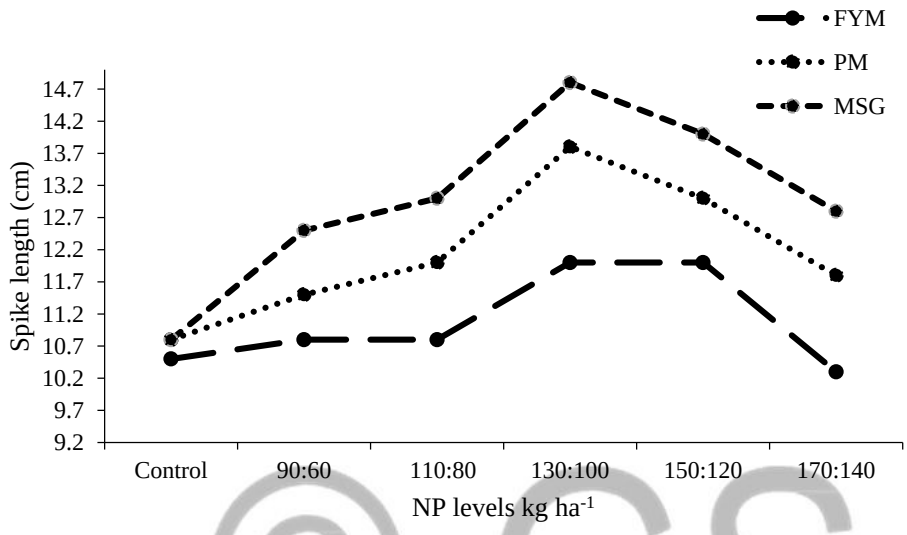

Figure 2. Combine effect of organic fertilizers and NP levels for Spike length (cm)

Grains spike^{-1}

The outcomes of grains spike^{-1} as affected by different levels of nitrogen and phosphorus (NP) and various organic fertilizers were displayed in (Table 4). The highest value recorded for grain production per spike was 56.9, observed in plots treated with an NP ratio of 130:100. These findings support previous studies emphasizing the importance of nutrient balance and the role of nitrogen and phosphorus in promoting plant growth and yield (Cakmak *et al.,* 2011; Lawlor, 2004). Among organic fertilizer Poultry manure resulted higher grains spike (54.2), while FYM treated plots resulted lowest grain yield (49.8). These finding aligns with previous research conducted by (Abid *et al.,* 2020; Padbhushan *et al.,* 2021) who stated that organic addition is of major significant that can improve soil quality and making availability of essential nutrients for crop productivity. These studies have also reported that organic fertilizers can enhance soil organic matter content, microbial activity, and nutrient retention, leading to improved crop growth and yield. Furthermore, the interaction between NP levels and organic fertilizers had a significant impact on grain production per spike. When poultry manure was combined with NP at ratio of 130:100, the value for grain production per spike was maximized, surpassing the effects of the other two organic fertilizers. However, increasing the NP levels beyond this optimal ratio led to a decline in grain production per spike (Fig 3). These results indicated that there exists an optimal balance between organic and inorganic (NP) fertilizers that can enhance grain production in wheat.

Table 4. Different NP levels and Organic fertilizer effect on Grains spike^{-1}

	NP levels (Kg ha^{-1})						
Organic fertilizer	CONTROL	(N-P) 90:60	(N-P) 110:80	(N-P) 130:100	(N-P) 150:120	(N-P) 170:140	MEANS
FYM	43.3	46	53	55	52.5	49	49.8b
PM	46.8	51.0	55.3	59.3	57.8	55.0	54.2a
MSG	43.8	49.3	50.8	56.5	53.5	49.3	50.5b
MEANS	44.6f	48.8e	53.0c	56.9a	54.6b	51.1d	

Farm Yard Manure (FYM), Poultry Manure (PM), and MaxiCrop Sea Gold (MSG).

Least Significant Differences value for Organic fertilizer at 5% level of probability = 1.55517
Least Significant Differences value for (N-P) level at 5% level of probability = 1.16474
Least Significant Differences value for Interaction at 5% level of probability = 2.01737
Mean values within the same category that are denoted by different letters indicate a significant difference from each other at a 5% level of probability, as determined by the LSD (Least Significant Difference) test.

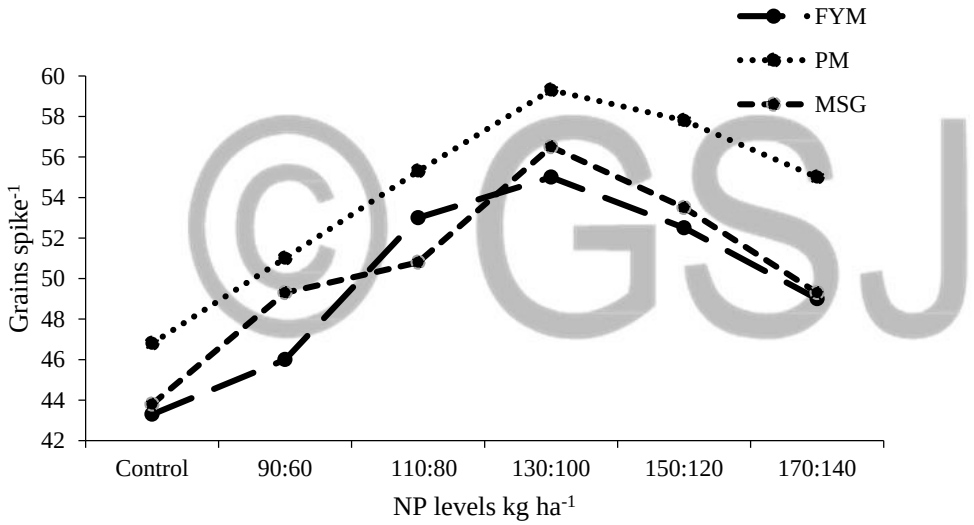

Figure 3. Combine effect of organic fertilizers and NP levels for Grains spike^{-1}

1000 **grain weight (g)**

Different NP levels and organic fertilizers significantly affected 1000 grain weight of wheat crop as presented in (Table 5). The experimental plots treated with an NP at ratio of 130:100, resulted a higher weight of a thousand grains (51.8 g) as compared to the control plots (40.8 g). The application of poultry manure resulted in a heavier weight of a thousand grains (47.6 g) compared to plots treated with farmyard manure (45.1 g) and Maxicrop Sea Gold (46.2 g). The increase in the thousand grain weight of wheat due to the application of poultry manure can be attributed to multiple factors. According to (Pedro *et al.,* 2011), it can be linked to a higher number of tillers and grains. Additionally, (Ojo *et al.,* 2021), found that the application of poultry manure also contributed to an increase in grain weight because it contains higher level of N, P and K content. There was also a significant interaction between organic fertilizer and NP levels (Fig 4). Increasing NP levels up to 130:100 in combination with poultry manure led to a significant increase in the weight of a thousand grain weight while suppressing the effect of Maxicrop Sea Gold and farmyard manure. However, further increasing NP levels significantly reduced the weight of a thousand grains. Onasanya *et al.,* 2009) conducted a study that yielded similar results, showing that the combined application of NP

and organic fertilizer resulted in increased grain weight. Additionally, (Cheema *et al.,* 2010) reported an increase in the weight of a thousand grains (g) when a balanced supply of organic and inorganic nutrients was provided.

Table 5. Different NP levels and Organic fertilizer effect on Thousand grain weight (g).

	NP levels (Kg ha^{-1})						
Organic fertilizers	CONTROL	(N-P) 90:60	(N-P) 110:80	(N-P) 130:100	(N-P) 150:120	(N-P) 170:140	MEANS
FYM	40.5	43.8	45.8	50.5	46.5	43.8	45.1c
PM	41.5	43.8	49	53.0	51.3	47.3	47.6 a
MSG	40.5	43.5	45.5	52.0	50.0	45.8	46.2 b
MEANS	40.8 f	43.7 e	46.8 c	51.8 a	49.3 b	45.6 d	

Farm Yard Manure (FYM), Poultry Manure (PM), and MaxiCrop Sea Gold (MSG).
Least Significant Differences value for Organic fertilizer at 5% level of probability = 1.22724
Least Significant Differences value for (N-P) level at 5% level of probability= 0.99487
Least Significant Differences value for Interaction at 5% level of probability= 1.72315
Mean values within the same category that are denoted by different letters indicate a significant difference from each other at a 5% level of probability, as determined by the LSD (Least Significant Difference) test.

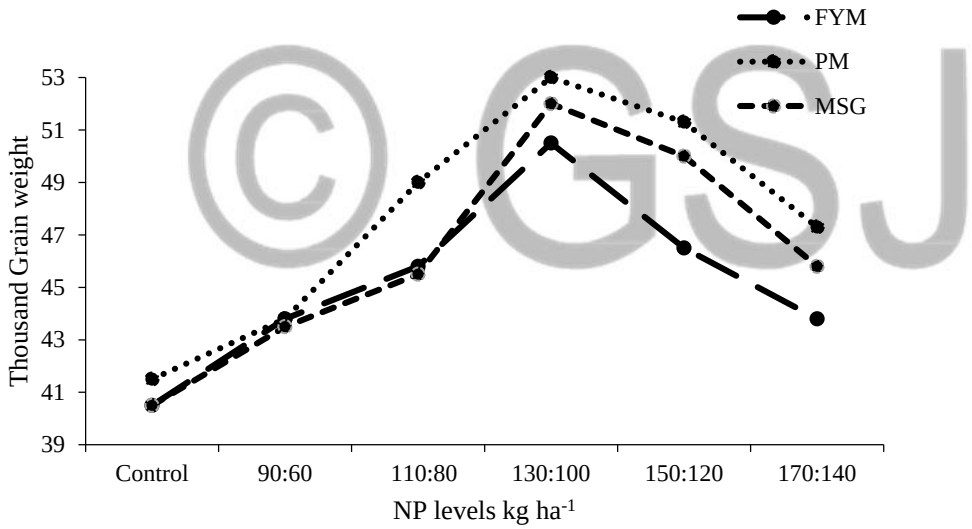

Figure 4. NP levels and organic fertilizer combine effect for Thousand Grain Weight

Biological yield (kg ha^{-1})

Impact of different levels of nitrogen (N), phosphorus (P), and organic fertilizers on the biological yield of wheat were presented in (Table 6). The greatest biological yield were noted in plots that received higher level of NP (130:100), resulting in a yield of 11,103.9 kg ha^{-1}. In contrast, the control plots resulted a lower biological yield of 7,657.3 kg ha^{-1} which did not received any fertilizer. These findings indicated the positive influence of N and P fertilization on crop productivity. Among organic fertilizer poultry manure application resulted higher biological yield (10,450.8 kg ha^{-1}) while farmyard manure resulted lower biological yield (8,766.7 kg ha^{-1}). Poultry manure contains essential nutrients which are readily available that can increase soil fertility. Our findings support the conclusions presented by (Channabasanagowda *et al.,* 2008), which indicated that the significant increase in biological yield can be attributed

to the direct provision of readily available nutrients, such as nitrogen, through organic manures. Moreover, the application of organic manures improves the proportion of water stable aggregates in the soil. Interactive effect of NP fertilizer and Poultry manure was significant (Fig 5). Increasing NP up to 130:100 in combination with poultry manure increased biological yield. (Matsi *et al.,* 2003) also reported that the use of inorganic and organic fertilizers together improved soil fertility and enhance the biological yield of wheat crops. These finding suggested that there might be an optimal range for nutrient application beyond which excessive fertilization reduces crop growth.

Table 6. Different NP levels and Organic fertilizer effect on Biological Yield (kg ha^{-1}).

	NP levels (Kg ha^{-1})						
Organic fertilizers	CONTROL	(N-P) 90:60	(N-P) 110:80	(N-P) 130:100	(N-P) 150:120	(N-P) 170:140	MEANS
FYM	7433.0	8303.8	9090.8	10058.0	9270.5	8444.0	8766.7 c
PM	7833.5	9827.3	11027.8	12427.0	11189.8	10399.3	10450.8 a
MSG	7705.3	9004.3	9234.3	10826.8	9568.8	9194.8	9255.7 b
MEANS	7657.3 f	9045.1 e	9784.3 c	11103.9 a	10009.7 b	9346.0 d	

Farm Yard Manure (FYM), Poultry Manure (PM), and MaxiCrop Sea Gold (MSG).
Least Significant Differences value for Organic fertilize at 5% level of probability = 147.603
Least Significant Differences value for (N-P) level at 5% level of probability = 200.376
Least Significant Differences value for Interaction at 5% level of probability = 347.060
Mean values within the same category that are denoted by different letters indicate a significant difference from each other at a 5% level of probability, as determined by the LSD (Least Significant Difference) test.

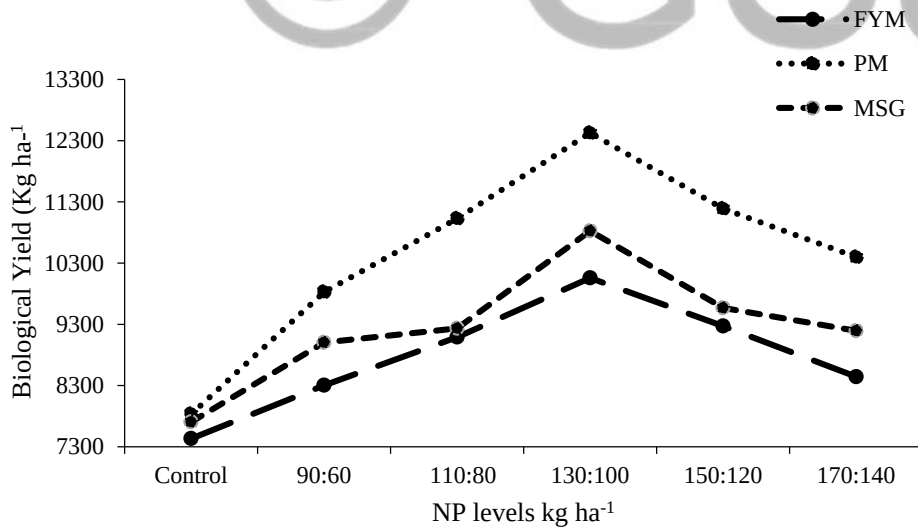

Figure 5. Interactive response of organic fertilizers and NP levels for Biological Yield (Kg ha^{-1})

Grain yield (kg ha^{-1})

Effect of various NP levels and organic fertilizers on the grain yield of wheat were displayed in (Table 7). Higher grain yield (3874 kg ha^{-1}) were noted in plots that received NP at 130:100 ratio while control plots that does not received

any treatment resulted lower grain yield (2545.33 kg ha^{-1}). It is noted that NP utilization at optimum rates can enhance growth, development and yield of wheat crop. Similar results were also reported by (Fana *et al.,* 2012; Haile *et al.,* 2012). Among organic fertilizers poultry manure application resulted highest grain yield (3594.83 kg ha^{-1}) followed by maxicrop sea gold (3160.33 kg ha^{-1}) while lowest yield (2945.66 kg ha^{-1}) were noted in FYM incorporated plots. Poultry manure contains macro and micro nutrients that can significantly increases fertility of soil. (Adekiya *et al.,* 2016) also reported that nutrient provided by poultry manure has positive effect on crop yield. Interactive response of organic fertilizers and NP levels were also found significant. Increasing NP levels up to (130:100) in combination with poultry manure, resulted higher grain yield. Our result are in line with (Ramadhan *et al.,* 2022) who worked on Fertilization and noted that organic and inorganic fertilization increases wheat crop grain yield and productivity.

Table 7. Different NP levels and Organic fertilizer effect on Grain Yield (kg ha^{-1}).

	NP levels (Kg ha^{-1})						
Organic fertilizer	CONTROL	(N-P) 90:60	(N-P) 110:80	(N-P) 130:100	(N-P) 150:120	(N-P) 170:140	MEANS
FYM	2374.0	2775	2977	3460	3186	2902	2945.66 c
PM	2649	3301	3822	4412	3909	3476	3594.83 a
MSG	2613	3050	3135	3750	3262	3152	3160.33 b
MEANS	2545.33 f	3042e	3311.33 c	3874 a	3452.33 b	3176.33 d	

Farm Yard Manure (FYM), Poultry Manure (PM), and MaxiCrop Sea Gold (MSG).
Least Significant Differences value for Organic fertilize at 5% level of probability = 55.100
Least Significant Differences value for (N-P) level at 5% level of probability = 85.88
Least Significant Differences value for Interaction at 5% level of probability = 148.75
Mean values within the same category that are denoted by different letters indicate a significant difference from each other at a 5% level of probability, as determined by the LSD (Least Significant Difference) test.

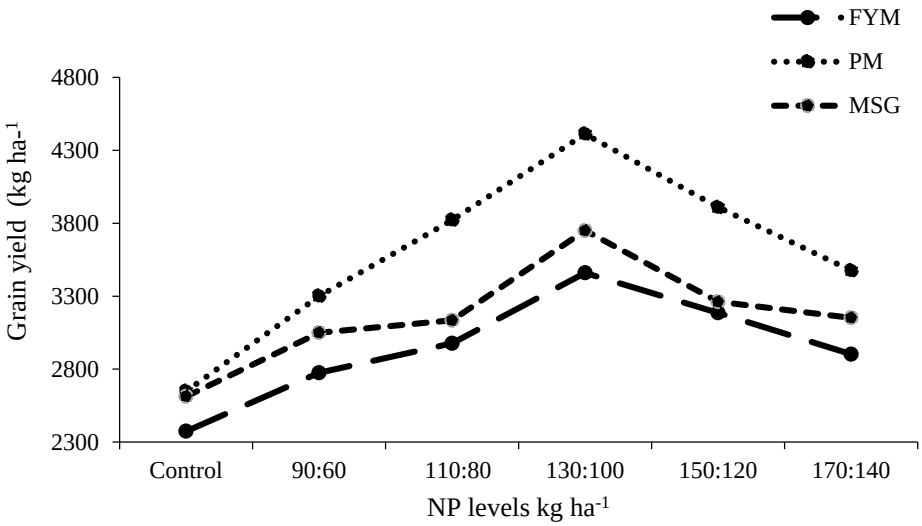

Figure 6. Interactive response of organic fertilizers and NP levels for Grain Yield (Kg ha^{-1})

CONCLUSIONS

Based on the aforementioned findings, it can be suggested that utilization of NP (nitrogen-phosphorus) in combination with poultry manure led to a significant increase in wheat yield. The most favorable outcome in terms of growth and yield parameters was achieved when applying NP at a ratio of 130:100 Kg ha^{-1}, along with 6 tons ha^{-1} of poultry manure. Consequently, our results strongly suggest that for optimal wheat performance, it is advisable to employ a NP ratio of 130:100 ha^{-1} in conjunction with poultry manure at a rate of 6 tons ha^{-1} for improving wheat crop yield and productivity.

REFERENCES

Abid, M., Batool, T., Siddique, G.S., Ali, R., Binyamin, M.J., Shahid, M., Rizwan, A.A., Alsahli, A.A. and Alyemeni, M.N. Integrated nutrient management enhances soil quality and crop productivity in maize-based cropping system. *Sustainability.* Vol.12, no. 23, pp.10214, 2020

Adekiya, A.O., Agbede T.M. and Ojeniyi, S.O. The effect of three years of tillage and poultry manure application on soil and plant nutrient composition, growth and yield of cocoyam. *Experimental Agriculture.* Vol.52, no. 3, pp.466–476, 2016

Ahmad, N. Soil fertility management: Key to food security and poverty alleviation. In *processing of 12th National Congress of Soil Science Society.* pp 17-18, 2002

Ahmad, S.I., Hussain, A., Ghaffar, M.Z., Saleem, M.W., Yonas, H., Hussnain Ikram, R.M. and Arslan, M.Organic amendments and conservation tillage improve cotton productivity and soil health indices under arid climate. *Scientific Report,* Vol.12, no. 1, pp.10214, 2022

Ahmed, M., Rauf, M., Mukhtar, Z. and Saeed, N.A. Excessive use of nitrogenous fertilizers: an unawareness causing serious threats to environment and human health. *Environmental Sciences and Pollution Research,* Vol. 24, pp. 26983–26987, 2017

Alessandrino, L., Gervasio, M.P., Vincenzi, F., Colombani, N., Castaldelli, G. and Mastrocicco, M. Nutrients and carbon fate in two lowland contrasting soils amended with compost. *Catena,* Vol.206, pp.105493, 2021

Ali, M.F., Ali, U., Bilal, S., Zulfiqar, U., Ohail, S. and Hussain, T. Response of sorghum and millet to poultry and farmyard manure–based biochar treatments. *Arabian Journal of Geoscience,* Vol. 15, no. 20, pp.1592, 2022

Bhardwaj, A.K., Rajwar, D., Mandal, U.K., Ahamad, S., Kaphaliya, B., Minhas, P.S., Prabhakar, M., Banyal, R., Singh, R., Chaudhari, S.K. and Sharma, P.C. Impact of carbon inputs on soil carbon fractionation, sequestration and biological responses under major nutrient management practices for rice-wheat cropping systems. *Scientific Report*, Vol.9, no. 1, pp. 9114, 2019

Busico, G., Mastrocicco, M., Cuoco, E., Sirna, M. and Tedesco, D. Protection from natural and anthropogenic sources: A new rating methodology to delineate "Nitrate Vulnerable Zones". *Environmental Earth Sciences,* Vol. 78, pp. 1-13, 2019

Cakmak, I., Yazici, A., Tutus, Y., & Ozturk, L. Glyphosate reduced seed and leaf concentrations of calcium, manganese, magnesium, and iron in non-glyphosate resistant soybean. *European Journal of Agronomy*. Vol. 31, no. 3, pp. 114-119, 2009

Cen, Y., Guo, L., Liu, M., Gu, X., Li, C. and Jiang, G.Using organic fertilizers to increase crop yield, economic growth, and soil quality in a temperate farmland. *Peer J.* Vol.8, e9668, 2020

Chand, S., Anwar, M. and Patra, D.D.Influence of long-term application of organic and inorganic fertilizer to build up soil fertility and nutrient uptake in mint mustard cropping sequence. *Communication in Soil Sciences and Plant Analysis.* Vol. *37*, no. 1-2, pp. 63–76, 2006

Channabasanagowda, N.K., Patil, B., Patil, B.N., Awaknavar, J.S., Ninganurn, B.T. and Hunje, R. Effect of organic manures on growth, seed yield and quality of wheat. *Karnataka Journal of Agriculture Sciences*. Vol. 21, no. 3, pp. 366-368, 2008

Cheema, M.A., Farhad, W., Saleem, F.M., Khan, H.Z., Munir, A., Wahid, M.A., Rasul, F. and Hammad, H.M. Nitrogen management strategies for sustainable maize production. *Crop Environment.* Vol. 1, pp. 49-52, 2010

Cisse, A., Arshad, A., Wang, X., Yattara, F. and Hu, Y. Contrasting impacts of long-term application of biofertilizers and organic manure on grain yield of winter wheat in north China plain. *Agronomy.* Vol. 9, no. 6, pp. 312, 2019

Darjee, S., Shrivastava, M., Langyan, S., Singh, G., Pandey, R., Sharma, A., Khandelwal, A. and Singh, R. Integrated nutrient management reduced the nutrient losses and increased crop yield in irrigated wheat. *Archives of Agronomy and Soil Science.* Vol. 69, no.8*,* pp.1298-1309, 2022

Dheri, G.S. and Nazir, G. A review on carbon pools and sequestration as influenced by long-term management practices in a rice–wheat cropping system. *Carbon Management.* Vol. 12, no. 5, pp. 559-580, 2021

Fana, G., Deressa, H., Dargie, R., Bogale, M., Mehadi, M. and Getachew, F. Grain hardness, hectoliter weight, nitrogen and phosphorus concentrations of durum wheat (*Triticum turgidum L.* var. Durum) as influenced by nitrogen and phosphorus fertilization. *World Applied Sciences Journal.* Vol. 20*,* no. 10, pp.1322-1327, 2012

Fauci, M.F. and Dick, R.P. Soil microbial dynamics: Short-and long-term effects of inorganic and organic nitrogen. *Soil Science Society of America Journal.* Vol. 58, no.3, pp. 801-806, 1994

Ghafoor, I., Habib-ur-Rahman, M., Ali, M., Afzal, M., Ahmed, W., Gaiser, T. and Ghaffar, A. (2021). Slow-release nitrogen fertilizers enhance growth, yield, NUE in wheat crop and reduce nitrogen losses under an arid environment. *Environmental Science and Pollution Research.* Vol. 28, no.32, pp. 43528-43543, 2021

Gowda, C., Patil, N.K.B., Patil, B.N., Awaknavar, J.S., Ninganurn, B.T. and Hunje, R. Effect of organic manures on growth, seed yield and quality of wheat. *Karnataka Journal of Agriculture Sciences.* Vol*.21*, no.3, pp. 366-368, 2008

Hafiz, M.H., Khaliq, A., Ahmad, A., Aslam, M., Malik, A.H., Farhad, W. and Laghari, K.Q. Influence of different organic manure on wheat productivity. *International Journal of Agriculture and Biology.* Vol. 13, pp. 137-140, 2011

Haile, D., Nigussie, D. and Ayana, A. Nitrogen use efficiency of bread wheat: Effects of nitrogen rate and time of application. *Journal of soil science and plant nutrition.* Vol.12, no.3, pp. 389-410, 2012

Hochman, Z. and Horan, H.Causes of wheat yield gaps and opportunities to advance the water-limited yield frontier in Australia. *Field Crops Research.* Vol. *228*, pp. 20-30, 2018

Hyder, S. I., Khan, A., Khan, R.U., Hameed, M.A., Aziz, H. and Abbas, M. Wheat (Triticum aestivumL.) Productivity and Soil Organic Matter (Som) Improvement by Integrated Nutrient Management (Inm) Under Irrigated Conditions. *Asian Journal of Plant and Soil Sciences*. Pp.195-201, 2021

Iqbal, A., He, L., Khan, A., Wei, S., Akhtar, K., Ali, I., Ullah, S., Munsif, F., Zhao, Q. and Jiang, L. Organic manure coupled with inorganic fertilizer: An approach for the sustainable production of rice by improving soil properties and nitrogen use efficiency. *Agronomy.* Vol. 9, no. 10, pp. 651, 2019

Iqbal, M., Khan, A.G., Hassan, A., Raza, M.A.W. and Amjad, A. Soil organic carbon, nitrate contents, physical properties and maize growth as influenced by dairy manure and nitrogen rates. *International Journal of Agriculture and Biology.* Vol. 14, no.1, pp. 20-28, 2012

Iqbal, M.N., Umair, A., Chishti, Z., Abbas, Z., Ahmad, H.R., Hamid, S. Haider, I. Exploring the best NP Ratio For wheat in perspective of present farmer fertilizer budget. *Abasyn Journal of Life Sciences.* Vol. 4, no.2, pp. 100-108, 2021

Khan, I., Amanullah, Jamal, A., Mihoub, A., Farooq, O., Farhan, M., Saeed Roberto, M., Radicetti, E., Zia, A., Azam, M. Partial substitution of chemical fertilizers with organic supplements increased wheat productivity and profitability under limited and assured irrigation regimes. *Agriculture*. Vol. 12, no.11, pp.1754, 2022

Kopittke, P.M., Menzies, N.W., Wang, P., McKenna, B.A. and Lombi, E. Soil and the intensification of agriculture for global food security. *Environment. International.* Vol. 132, pp. 105078, 2019

Kumar, S., Sharma, S.K., Dhaka, A.K., Bedwal, S., Sheoran, S., Meena, R.S., Jangir, C.K., Kumar, D., Kumar, R. and Jat, R.D. Efficient nutrient management for enhancing crop productivity, quality and nutrient dynamics in lentil (Lens culinaris Medik.) in the semi-arid region of northern India. Plos one, 18, no.2. e0280636, 2023`

Laird, D.A., Fleming, P., Davis, D.D., Horton, R., Wang, B., & Karlen, D.L. Impact of biochar amendments on the quality of a typical Midwestern agricultural soil. *Geoderma. Vol. 158*, no. 3-4, pp.443–449, 2010

Lawlor, D.W., Mengel, K. and Kirkby, E.A. Principles of plant nutrition. Pp. 479-480, 2004

Masoni, A., Ercoli, L., Mariotti, M. and Arduini, I. Post-anthesis accumulation and remobilization of dry matter, nitrogen and phosphorus in durum wheat as affected by soil type. *European Journal of Agronomy.* Vol. *26,* no.3, pp. 179-186, 2007

Matsi, T.A., Lithourgidis, S. and Gagianas, A.A. Effect of injected liquid cattle manure on growth and yield of winter wheat and soil characteristics. *Agronomy Journal.* Vol. *95,* no.3, pp. 592-596, 2003

Migliorini, P., & Wezel, A. Converging and diverging principles and practices of organic agriculture regulations and agroecology. a review. *Agronomy for sustainable development.* Vol. 37, pp. 1-18, 2017

Nethra, N., Jayaprasad, K. and Kale, R. China aster [Callistephus chinensis (L)] cultivation using vermicompost as organic amendment. *Crop Research Hisar.* Vol. 17, no. 2, pp. 209-215, 1999

Ojo, O., Ogunwande, G., Adesanwo, O. and Olatoberu, F. Effect of Effluent from Biodigestion of Pre-Treated Rice Bran and Animal Manure on the Dry Matter Yield and Nutrient Uptake of Amaranthus viridis. *Food and Nutrition Sciences.* Vol. 12, no.12, pp. 1255-1268, 2021

Onasanya, R.O., Aiyelari, O.R., Onasanya, A., Oikeh, S., Nwilene, F.F. Oyelakin, O.O. Growth and yield response of maize to different rate of nitrogen and phosphorous fertilizers in southern Nigeria. *World Journal of Agriculture Science.* Vol*. 5*, no. 4, pp. 400-407, 2009

Padbhushan, R., Sharma, S., Kumar, U., Rana, D.S., Kohli, A., Kaviraj, M., Parmar, B., Kumar, R., Annapurna, K., Sinha, A.K. and Gupta, V.V.S.R.Meta-analysis Approach to measure the effect of integrated nutrient management on crop performance microbial activity and carbon stocks in indian soils. *Frontiers In Environmental Sciences*. 396, 2021

Panayotova, G., Kostadinova, S. and Valkova, N. Grain quality of durum wheat as affected by phosphorus and combined nitrogen-phosphorus fertilization. Scientific papers. Series. A. *Agronomy.* Vol. 60, pp. 356–363, 2017

Pedro, A., Savin, R., Habash, D.Z. and Slafer, G.A. Physiological attributes associated with yield and stability in selected lines of a durum wheat population. *Euphytica.* Vol. 180, pp. 195-208, 2011

Ramadhan, M.N.Yield Performance of Wheat Under Different Practices of Tillage and Integrated Inorganic and Organic Fertilizers. In IOP Conference Series: *Earth and Environmental Science*. Vol. 1060, no.1, pp. 012090, 2022

Randhawa, M.S., Maqsood, M., Wajid, S. and Anwar-ul-Haq, M. Effect of integrated plant nutrition and irrigation scheduling on yield and yield components of maize (Zea mays L.). *Pakistan Journal of Agriculture Sciences.* Vol. *49*, no.3, pp. 267–273, 2012

Rasul, G.A. M., Ahmed, A.M. and Ahmed, M.Q. (2015). Influence of different organic fertilizers on growth and yield of wheat. American-Eurasian *Journal of Agriculture and Environmental Science.* Vol. 15, no.6*,* pp. 1123-1126, 2015

Singh, V.I.N.A.Y. Effect of balanced use of nutrients on productivity and economics of wheat (Triticum aestivum). *Annals of Plant and Soil Research.* Vol. 19, no.1, pp. 105-109, 2017

Srivastav, A.L. Chemical fertilizers and pesticides: Role in groundwater contamination. *In Agrochemicals Detection, Treatment and Remediation. Butterworth-Heinemann*. Pp. 143–159, 2020

Su, Y.Z., Wang, F., Suo, D.R., Zhang, Z.H. and Du, M.W. Long term effect of fertilizer and manure application on soil-carbon sequestration and soil fertility under the Wheat-maize cropping system in northwest China. *Nutrient cycling in Agronomy. Ecosystems.* Vol. *75*, pp. 285-295, 2006

Tawfik, M.M. and Gomaa, A.M.Effect of organic and biofertilizers on the growth and yield of wheat plants. Egyptian Journal of Agriculture Research. Vol. 2, pp. 2, pp. 711-725, 2005

Yang, Z., & Ha, L. (2013). Analysis and comparison of nutrient contents in different animal manures from Beijing suburbs. *Agriculture Sciences.* Vol.4, pp. 50–55, 2013

Zhang, H., Hamilton, D.W. and Payne, J. Using poultry litter as fertilizer. Oklahoma Cooperative Extension Service, 2017