Original Research Article

Effectof organicmanuresandbio-fertilizersongrowthandyieldofbabycorn

ABSTRACT

A field experiment was conducted during *zaid* 2022 at Crop Research Farm, Department of Agronomy,SHUATS, Prayagraj (U.P) on the topic "Effect of Organic manures and Bio-fertilizers on growth andyield of baby corn", to study the response of Farm Yard Manure (FYM)- 20t/ha, Poultry Manure- 4t/ha,Vermicompost-4t/haalongwiththecombination of biofertilizerssuchas,*Azatobactor*(20g)and*Azospirillum* (20g). The results revealed that Based on the objective under taken, significant and higherplantheight(138.7 cm),higher plantdry weight (55.49 g),maximum number of cobs/plant(1.93),higher cob length (19.1 cm), higher cob weight (52.54 g), higher cob yield with husk (9.07 t/ha), highercob yield with-out husk (3.90 t/ha), higher stover yield (22.05 t/ha), Harvest index (29.15 %), maximumGross returns (1,34,773.33 INR/ha), Net returns (87,106.33 INR/ha) and Benefit cost ratio (1.83) wasalsorecordedintreatment6[poultrymanure(4t/ha)+Azotobactor(20g)+Azospirillum(20g)].

Keywords: Bio-fertilizers,Organicmanures,Growth,Yield,Economics.

INTRODUCTION

Baby cornis avegetablepickedfrom regularmaizeorsweetcorn plants when theears arestillpremature and immediately after the emergence of white silk (2–3 cm) length. It is very young cob withundeveloped seeds, obtained from a corn plant at about 45-60 days after sowing or 2-3 days after silkingOne hundred grams of baby corn are found to be rich in 89.1% Moisture, 1.9 g Protein, 0.2 g Fat, 0.06 gAsh,8.2mgCarbohydrate,28mgCalcium,86mgPhosphorusand11mgAscorbicAcid.**(Thavaprakash *et al.* 2005).** It is a warm weather crop and grows from sea level 3000m altitude andoptimum temperature for better growth is 28-32oC. It grows well in areas with annual rainfall 250-400cm. It can be grown successfully in soils with pH ranging from 6.5-7.5. The alluvial soils of UttarPradesh are well suitable for raising baby corn. The soils with sandy loam to silty loam texture are bestforthecrop**(Tomar*et.al*2011)**

Globallymaizegrowninamerica,AsiaandAfrica.Itiscultivatedgloballyoveranareaofabout

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169.81 million hectares with a production of 835.32 million tonnes with the productivity of 49.2 q/ha**(USDA, 2023)**. In India, which is the fifth-largest producer in the world and accounts for 3% ofworldwideproduction,maizeisgrownoveranareaofroughly9.18 million hectares, with a yield of 27.23 million tonnes and an average productivity of 2965 kg/ha. With acontributionof14.87%(1.37milliontonnes)ofthe totalIndianmaizeproducedarea,whileUttarPradeshgivesanareaofapproximately0.73million hectares witha7.98%totheentirecountryofIndia,whichhasaproductionofapproximately1.53million**(GOI,2021)**.

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Application of inorganic fertilizers helps in obtaining maximum production of baby corn but,itincreasesthecostofproductionalongwithitshazardouseffectsonenvironmentalhealth.Synthetic fertilizers have become the primary nutrient sources for agriculture over the last 50 yearsbecauseof certain advantagesbehindtheiruse.Buttheirextravagantusehascreated severalenvironmental problems like soil acidity and nutrient imbalance, which may result in reduction ofcrop yield. So, judicious uses of nutrients from different source of organic as well as bio-fertilizerswillmaintaintheenvironmentalsustainability

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Organic fertilizers including Farm yard manure, Poultry manure, Vermicompost may be used forcrop production as substitutes or supplements of the chemical fertilizers. FYM occupies an importantposition among the organic manures. The FYM seems to actdirectly by increasing crop yield byacceleration of respiratory process or by cell permeability or by hormonal growth action. Soil physicalqualities can also be enhanced with the use of FYM. Soil organic carbon, nitrogen, phosphorus, andpotassium levels all improve as a result of this, as do the soil's chemical characteristics. It supplies N, Pand K in available form to the plant through biological decomposition. Its has a efficiency to improve Nfertilizer in the presence of FYM application. Substitution of 50 percent mineral fertilizer-N by FYM indifferentagro-ecoregionshasbeenfoundtosustaintheproductivityinalongtermexperimentsinvolving various food, fodder crop sequences and inorganic and inorganic sources of nitrogen. Poultrymanure is a valuable fertilizer and can serve as a suitable alternate to chemical fertilizers. Poultrymanures provide organic matter to soil and nutrients to crops. Poultry manure is a good source of majorandminormineralelementsthatarecapableofenhancingsoilfertilityonapplication.Recentlyvermicompost as source of organic manure in crop production is gaining popularity due to its highernutrient content, faster mineralization and acceptability. Vemicompost has been reported to give veryhigh to crop productivity along with maintaining higher nutritional quality and improving the physical,chemical and biological properties of soil. Vermicompost is highly nutritive and a powerful plant growthpromoter and protector and has scientifically proven to be a miracle plant growth promoter. It alsoincreasestheefficiencyofaddedfertilizersinthesoil.

Biofertilizers are microbial inoculants of selective microorganisms like bacteria, algae, fungi,already existing in nature. They increase the biological fixation of atmospheric nitrogen and enhancephosphorous availability to baby corn crop. Therefore, introduction of efficient strain of azospirillum inthe soil which is poor in nitrogen may be helpful in boosting up production and consequently morenitrogen fixation. Among several bio agents, azospirillum and azotobacter is known to fix atmosphericnitrogen and increased about 10-15 per cent grain yield in baby corn. On an average 20 and 22 kg ofnitrogen/hacanbesavedbyinoculationofbabycornseedbeforesowingwithazotobacterorazospirillum, respectively. Many researchers optimistically predicted that microorganisms azotobacterandazospirillumassociationscouldbelucrativelymanagedtoreducedependenceonchemicalfertilizers, but promises concerning the applied value of azotobacter in agriculture have been morerhetorical than deliverable **(Dawson *et al.* 2017)**. Withthis in mind, the experiment was carried out todeterminethe **"EffectofOrganicmanuresandBio-fertilizersongrowthand yieldof babycorn"**

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MaterialandMethods

A field experiment was conducted during *zaid*2022 at Crop Research Farm, Department of Agronomy,SHUATS, Prayagraj (U.P) on the topic to"Effect of Organic manures and Bio-fertilizers on growth andyield of baby corn",to study the response of Farm Yard Manure (FYM)- 20t/ha, poultry Manure- 4t/ha,Vermicompost-4t/haalongwiththecombination of biofertilizerssuchas,*Azatobactor*(20g)and*Azospirillum* (20g).deThe soil of experimental plotwas sandy loam in texture, nearly neutral insoilreaction (pH 8.0), low in organic carbon (0.62 %), available N (225 kg/ha), available P (38.2 kg/ha) andavailableK(240.7kg/ha).Therewere9treatments,eachbeingreplicatedthriceandlaidoutinRandomized Block Design. The treatment combinations are FYM 20t/ha + Azotobactor (20g), FYM20t/ha + Azospirillum (20g), FYM 20t/ha + Azotobactor (20g) + Azospirillum (20g), poultry Manure4t/ha+Azotobactor(20g),PoultryManure4t/ha+Azospirillum(20g),poultryManure4t/ha+Azotobactor(20g)+Azospirillum(20g), Vermicompost4t/ha+Azotobactor(20g),Vermicompost4t/ha + Azospirillum (20g)and Vermicompost4t/ha + Azotobactor (20g)+ Azospirillum (20g).Growthparameters, yield attributes and economics was recorded. The Data recorded on different aspects of crop,such as,growth parameters,yieldattributesweresubjected tostatistically analysisby analysisofvariancemethod**(GomezandGomez,1976)**.

RESULTANDDISCUSSION

GrowthParametersofGroundnutP

lantheight(cm)

The data revealed that, significantly higher plant height (138.7 cm) was recorded in treatment 6 [wpoultryManure(4t/ha)+ Azotobacter(10g)+ Azospirillum (10g)]ascomparedtorestof thetreatments.However, the treatment 5 [apoultry Manure (4t/ha) + Azospirillum (20g)] was found to be statistically atpar with treatment 6the[poultry Manure (4t/ha) + Azotobacter (10g) + Azospirillum (10g)]. Significant anddehigher plant height was recorded with poultry manure (4t/ha) might be due to poultry manure improvessoil fertility by adding essential nutrients and soil organic matter in the soil, which improves soilmoisture and nutrient retention, results in better growth and development of the crop. Similar result wasalsoreportedby**Hossain*etal.*(2012)**.Significantandhigherplantheightwasrecordedwith*Azotobacter* might be due to seed treatment with bio-fertilizers increases nitrogen availability by fixingthe appreciable amount of molecular nitrogen and makes available for plant growth and enhance plant

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insynthesisofgrowth-promotingenzymelikeindoleaceticacid(IAA),gibberellins,vitamins,which

alteredthemicrobialbalanceintherhizosphereandproducingmetabolitesresultsingrowthanddevelopment of Plant. Similar result was also reported by **Patel *et al.* (2014)** in pearl millet. Further,significantlyand higher plant height was recorded with Azospirillum might be due to increasing nutrientsup taking by plant and improving soil properties such as organic content, which enhance plant growththrough increasing availability nitrogen. Similar result was also reported by **Hoshang *et al.* (2011)** inmaize.

PlantDryWeight(g)

The data revealed that, significantly higher plant dry weight (55.49 g) was recorded in treatment 6[PoultryManure(4t/ha)+Azotobacter(10g)+Azospirillum(10g)]ascomparedtorestofthetreatments. However, the treatment 5 [Poultry Manure (4t/ha) + Azospirillum (20g)] was found to bestatistically at par with treatment 6 [Poultry Manure (4t/ha) + Azotobacter (10g) + Azospirillum (10g)].Significant and higher plant dry weight was recorded with Poultry manure (4t/ha) might be due tooptimum availability of essential nutrients through poultry manure leads to increase in leaf area enhancethe photosynthesis rate and plant biomass, which may have attributed to achieve higher dry matteraccumulation.Similarresultwasalsoreportedby**Kharche*etal*.(2020)**.Significantandhigherplantdry weight was recorded with *Azotobacter* might be due to azotobacter fixes atmospheric nitrogen andenhance plant growth promoters, which increase in plant growth and increases ability to uptake morewater and nutrients results in production of more biomass. Similar result was also reported by **Marngarand Dawson, (2017)** in maize. Further, significant and higher plant dry matter was recorded with*Azospirillum* might be due to seed treatment with azospirillum fixes air nitrogen which promotes plantgrowth, increases root hairs, uptake of water and nutrients results in accumulation of more dry matter.Similarresultwasalsoreportedby**MarngarandDawson,(2017)**inmaize.

YieldandYieldAttributes

NumberofCobs/plant

Thedatarevealedthat,significantandmaximumnumberofcobs/plant(1.93)wasrecordedintreatment 6[poultryManure(4t/ha)+Azotobacter(20g)+Azospirillum(20g)]ascomparedtorest ofthe

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treatments. However, the treatment 5 [poultry Manure (4t/ha) + Azospirillum (20g)] and treatment 9[Vermicompost (4t/ha) + Azotobacter (20g) + Azospirillum (20g)] was found to be statistically at parwith treatment 6 [poultry Manure (4t/ha) + Azotobacter (20g) + Azospirillum (20g)]. Significant andmaximum number of cob/plant was recorded with Poultry manure (4tn/ha) might be due to greateravailability of photosynthates, metabolites and nutrients results in develop of reproductive parts andincreased number of cobs/ plant. Similar result was also reported by **Addepalli and Debbarma, (2022)**inmaize.

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Length ofCob(cm)

The data revealed that, significantand maximumnumber of seeds/pod (19.1 cm) was recorded intreatment6 [poultry Manure (4t/ha)+ Azotobacter (20g) + Azospirillum (20g)]as compared to rest ofthe treatments. However, the treatment 5[poultry Manure (4t/ha) + Azospirillum (20g)] was found to bestatistically at par with treatment 6 [poultry Manure (4t/ha) + Azotobacter (20g) + Azospirillum (20g)].Significantandhigherlength of cob was recordedwith Poultry manure (4tn/ha)mightbe due toincreasing photosynthetic rate and translocation of photosynthates towards the sink results in development of coblength. Similar result was also reported by **sawant *et al.* (2020)**. Further, significantly and higher length ofcob was recorded with Azotobacter might be due to adequate availability of nutrients, Photosynthatesand metabolites, which help in development of reproductive parts and results in increase of cob length.Similarresultwasalsoreportedby**Raj*etal*.(2016)**.

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Weightofcob(g)

Significant and higher seed index (52.54 g) was recorded in treatment 6 [poultry Manure (4t/ha) +Azotobacter (20g) + Azospirillum (20g)] as compared to rest of the treatments. However, the treatment 5[poultry Manure (4t/ha) + Azospirillum (20g)] was found to be statistically at par with treatment 6[poultryManure(4t/ha)+Azotobacter(20g)+Azospirillum(20g)].

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A significantandhigherweightofcobwasrecordedwithpoultrymanure(4t/ha)mightbedue togreateravailability of photosynthates, metabolites and nutrients to develop reproductive structures which,leadstoincreaseincobweight.Similarresultwasalsoreportedby**Kumar*etal*.(2022).**Further,

significant and higher weight of cob was recorded with *Azotobacter* and *Azospirillum* might be due toincreased cob weight appears to be the result of more photosynthates,metabolitesand nutrients beingavailabletobuildreproductivestructures incobweight.Similar resultwasalsoreportedby**Jinjala*etal.*(2016)**.

Cobyield (t/ha)

I. WithHusk(t/ha)

The data revealed that, Significant and higher seed yield (9.07 t/ha) was recorded in treatment 6 [poultryManure(4t/ha)+ Azotobacter(20g)+ Azospirillum (20g)]ascomparedtorestof thetreatments.However, the treatment 5 [poultry Manure (4t/ha) + Azospirillum (20g)] and treatment 9 [Vermicompost(4t/ha) + Azotobacter (20g) + Azospirillum (20g)] was found to be statistically at par with treatment 6[poultry Manure (4t/ha) + Azotobacter (20g) + Azospirillum (20g). Significantlyand higher cob yield withhusk was recorded with poultry manure (4tn/ha) might be due to higher mineralization potential ofpoultry manure enabling it to active and fast release of its nutrients for plant uptake. Similar result wasalso reported by **Kharche *et al.* (2020).** Further, significantlyand higher cob yield with husk was recordedwith Azotobacter and Azospirillum might be due to nitrogen fixing bacteria could be beneficial source toenhance plantgrowth and produce considerable amounts of biologically active substances such as,auxin, gibberellin etc. that promote growth of reproductive organs and increase plants productivity.highermineralizationpotentialofpoultrymanureenablingittoactiveandits nutrientsuptakeofplants.

II. WithoutHusk(t/ha)

Significant and higher seed yield (3.90 t/ha) was recorded in treatment 6 [Poultry Manure (4t/ha) +Azotobacter (20g)+Azospirillum(20g)]ascompared torestofthetreatments.However,thetreatment5

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[PoultryManure(4t/ha)+Azospirillum(20g)]wasfoundtobestatisticallyatparwithtreatment6 [PoultryManure(4t/ha)+Azotobacter(20g)+Azospirillum(20g)].

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Stoveryield(t/ha)

The data revealed that a significantand higher Stover yield (22.05 t/ha) was recorded in treatment 6[poultry Manure (4t/ha) + Azotobacter (20g) + Azospirillum (20g)] as compared to rest of the treatments.However, the treatment 5 [poultry Manure (4t/ha) + Azospirillum (20g)] and treatment 9 [Vermicompost(4t/ha) + Azotobacter (20g) + Azospirillum (20g)] was found to be statistically at par with the treatment 6[poultry Manure (4t/ha) + Azotobacter (20g) + Azospirillum (20g)]. Significant and higher Stover yieldwas recorded with poultry manure (4tn/ha) might be due to incorporation of organic manures increasesthe availability of plant nutrients and helps in formation of organic acids through decomposition process,which develops native nutrients within the soil andincreases theiravailability to plantsfor bettervegetative growth and leads to increase in stover yield. Similar result was also reported by **Kharche *etal.*(2020)**.

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Significant and higher stover yield was recorded with *Azotobacter* might be due to bacterization withazotobacterculturehelpinginfixationofatmosphericnitrogen,secretionofgrowthpromotingsubstances, resulting in better seed germination and expanded root system for nutrient uptake, whichresultsinproductionofmorestoveryield.Similarresultwasalsoreportedby**Laxminarayana,(2001)**in maize. Further, significant and higher stover yield was recorded with *Azospirillum* might be due tofixation of atmospheric nitrogen,enhance production of indoleacetic acid,gibberellin andcytokininelike substances results in more nutrient uptake and crop production. Similar result was also reported by**Laxminarayana,(2001)**inmaize.

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HarvestIndex(%)

The data revealed that, Significant and higher harvest index (29.15 %) was recorded in treatment 6[PoultryManure(4t/ha)+Azotobacter(20g)+Azospirillum(20g)]ascomparedtorestofthetreatments.Howev er,thetreatment5[PoultryManure(4t/ha)+ Azospirillum(20g)],treatment7[Vermicompost (4t/ha) + Azotobacter (20g)], treatment 8 [Vermicompost (4t/ha) + Azospirillum (20g)]and treatment 9 [Vermicompost (4t/ha) + Azotobacter (20g) + Azospirillum (20g)] was found to bestatisticallyatparwithtreatment6[PoultryManure(4t/ha)+Azotobacter(20g)+Azospirillum(20g)].

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Significant and higher harvest index was recorded with *Azotobacter* and *Azospirillum* might be due touse of biofertilizers may lead tohigher availability of nitrogen and phosphorus thatpromoted growthanddevelopmentandultimatelyresultinginhigheryields. Similarresultwasalsoreportedby**Rani*etal.*(2018)**insorghum.

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Table1 Effect ofOrganicmanuresand Bio-fertilizersonGrowthParameters ofbabycorn

S.No.	Treatmentscombination	GrowthParameters	
		Plant Height60 DAS	**PlantDry weight 60DAS**
1	FYM20t/ha +Azotobactor(20g)	122.4	45.64
2	FYM20t/ha +Azospirillum(20g)	125.4	46.91
3	FYM20t/ha + Azotobactor(10g)+Azospirillum(10g)	131.9	50.27
4	PoultryManure4t/ha+Azotobactor(20g)	131.1	49.05
5	PoultryManure4t/ha +Azospirillum(20g)	137.0	54.73
6	PoultryManure 4t/ha +Azotobactor(20g)+Azospirillum(20g)	138.7	55.49
7	Vermicompost4t/ha +Azotobactor(20g)	128.6	48.39
8	Vermicompost4t/ha+Azospirillum(20g)	132.7	50.70
9	Vermicompost4t/ha+ Azotobactor(20g)+ Azospirillum(20g)	134.3	52.09
	F-test	S	S
	SEm(±)	0.6	0.27
	CD(p =0.05)	1.9	0.82

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Table2Effectoforganicmanuresandbio-fertilizersonyieldandyieldattributesofbabycorn

S. No. Treatmentcombinations	Number ofCobs/plant	Length ofcob(cm)	Weight of cob(g)	Cob yieldWith husk(t/ha)	Cobyield With outhusk(t/ha)	Stover Yield(t/ha)	HarvestIndex(%)
1.FYM20t/ha+ Azotobactor(20g)	1.27	16.3	43.79	7.81	2.11	20.41	27.65
2.FYM20t/ha+ Azospirillum(20g)	1.47	16.8	45.84	7.94	2.29	20.53	27.89
3.FYM20t/ha+ Azotobactor(20g)+Azospirillum(20g)	1.67	17.8	48.40	8.56	2.60	21.02	28.93
4.PoultryManure4t/ha+ Azotobactor(20g)	1.53	17.5	48.31	8.37	2.47	20.86	28.65
5.PoultryManure4t/ha + Azospirillum(20g)	1.87	18.6	51.42	8.84	3.68	21.64	29.00
6.PoultryManure 4t/ha+Azotobactor(20g)+ Azospirillum(20g)	1.93	19.1	52.54	9.07	3.90	22.05	29.15
7.Vermicompost4t/ha+Azotobactor(20g)	1.47	17.1	46.70	8.02	2.36	20.61	28.01
8.Vermicompost4t/ha+Azospirillum(20g)	1.73	18.0	48.61	8.63	2.84	21.17	28.97
9.Vermicompost4t/ha+Azotobactor(20g)+Azospirillum(20g)	1.80	18.2	49.52	8.71	3.15	21.30	29.01
F-test	S	S	S	S	S	S	S
SEm(±)	0.06	0.25	0.37	0.13	0.10	0.26	0.40
CD(p =0.05)	0.19	0.74	1.13	0.39	0.31	0.78	1.22

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CONCLUSION

Based on the above findings it can be concluded that, application of Poultry manurealong with azotobacter and Azospirillum (treatment 6) was observed highest yield of babycornandbenefitcostratio.

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Comment [jS93]: Keep the pattern as mentioned in above 2 reference