

Evaluation of Organic and Inorganic Fertilizers on Growth and Yield of Onion (*Allium cepa* L.) under Subabul (*Leucaena leucocephala*) Based Agroforestry System

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ABSTRACT

A study was carried out at the Research and Nursery of College of Forestry, Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh. The study was comprised of Ten Treatments replicated thrice. The results showed maximum plant height (29.39 cm) at 30 DAT, (54.06 cm) at 60 DAT, (57.54 cm) at 90 DAT, Neck thickness (1.383 cm) at 90 DAT, leaf length (49.707 cm) at 90 DAT, numbers of leaves (8.86) at 90 DAT, Bulb weight (73.977 g), Bulb diameter (5.323 cm), Bulb height (6.030 cm), Bulb yield/plot (11.09 Kg/plot) and (27.737 Kg/Ha) in Treatment T₆ (75% NPK +25 % Poultry Manure maximize the onion growth and yield under Subabul (*Leucaena leucocephala*) based Agroforestry system. Therefore it may be recommended to the farmers for obtaining better growth and yield.

Keywords: Agroforestry, Fertilizer, Inorganic, Organic, Onion.

INTRODUCTION

Agroforestry is a collective name for land-use systems and technologies where woody perennials are deliberately grown on the same land-management units as along with agricultural crops and/or animals, in some form of spatial arrangement or temporal sequence. In Agroforestry systems there are both ecological and economical interactions between the different components (Lundgren

& Raintree, 1982). A system combining agricultural and tree crops of varying longevity (ranging from annual through biannual and perennial plants), arranged either temporally (crop rotation) or spatially (intercropping), to maximize and sustain agricultural yield (Vergara, 1981). Many multipurpose trees having productive and protective functions are integrated into the system in different spatial and temporal arrangements.

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Most of these trees closely interact with agricultural crops when grown. These trees include teak (*Tectona grandis*), Jack-trees (*Artocarpus spp.*), *Casuarina equisetifolia*, *Mangifera indica*, *Ceiba pentandra*, *Leucaena leucocephala*, *Grevillea robusta*, *Bambusa arundinacea*, *Erythrina variegata* and *Gliricidia sepium* (both good support to Black Pepper).

Possible impacts of Agroforestry are controlling poverty through increased income by higher production of Agroforestry products for home consumption and market. Food security by restoring farm soil fertility for food crops and production of fruits, vegetables, nuts and edible oils. Empowerment to women farmers and other less-advantaged rural residents whose rights to land are insecure through better negotiations. Reducing deforestation and pressure on the forest by providing fuel wood grown on farms. Increasing buffering capacity of farmers against the effects of global climate change on-farm tree crops and tree cover. Improving soil health of the farm through ameliorated micro-climate and nutrition level. Augmenting accessibility to medicinal trees for the cure of common and complex diseases (Jacobson et al., 2013). The goal is to enhance the production of more than one harvestable component at a time, while also providing conservation benefits. The tree, crop and/or animal components are structurally and functionally combined into a single, integrated management unit, production with resource conservation. (Tewari, 2002).

Subabul (*Leucaena leucocephala*) is a medium sized fast growing tree that belongs to the family Fabacea, native to southern Mexico and northern Central America (Hill, 1971) but is now naturalized throughout the tropics. Common names include white lead tree, jumbay, river tamarind, *Subabul*, and white popinac. *L.leucocephala* is used for a variety of purposes, such as firewood, timber, human food, green manure, shade and erosion control. *Leucaena leucocephala*, formerly known as *L. glauca*, is a thornless long-lived shrub or tree

which may grow to heights of 7-18 m. Leaves are bipinnate with 6-8 pairs of pinnae bearing 11-23 pairs of leaflets 8-16 mm long. The inflorescence is a cream coloured globular shape that produces a cluster of flat brown pods 13-18 mm long containing 15-30 seeds. *Leucaena leucocephala* has a wide variety of uses and it was this multiplicity of roles that led to the worldwide reputation of the species as a 'miracle tree'. First and foremost, the leaves of *Leucaena* are highly nutritious for ruminants and many excellent animal productions. Secondly, *Leucaena* can be used in cropping systems. Contour strips of *leucaena* have been employed for many years in the Philippines and in Timor and Flores in Indonesia. The strips serve as erosion control on steep slopes and as a form of alley cropping in which *leucaena* foliage is mulched into the soil to enhance yields of inter-row crops. *Leucaena* is capable of producing a large volume of a medium-light hardwood for fuel (specific gravity of 0.5-0.75) with low moisture and a high heating value, and makes excellent charcoal, producing little ash and smoke. It also can be used for parquet flooring and small furniture as well as for paper pulp. *Leucaena* poles are useful for posts, props and frames for various climbing crops (Brewbaker, 1982). Other uses include production of necklaces from seeds and the use of young leaves and seeds as vegetables for human consumption. Young green pods can be split open and the fresh immature seeds are eaten raw or cooked. Only small amounts can be eaten in this way because of the presence in seed and young growth of the toxic amino acid mimosine. *Leucaena leucocephala* will occasionally produce a gum similar to gum arabic when stressed by disease or insect pests. When *L. leucocephala* was hybridised with *L. esculenta*, some segregating trees produced gum heavily in the dry season. The hybrids were seedless, had good vigour and were psyllid resistant (Brewbaker, 1987). *Leucaena* is a tropical species requiring warm temperatures (25-30°C day temperatures) for optimum growth (Brewbaker et al., 1985). *Leucaena* is not tolerant of even light frosts

which cause leaf to be shed. Heavy frosts will kill all above ground growth, although the crowns survive and will re-grow vigorously in the following summer with multiple branches. Alley cropping is a type of Agroforestry system consisting of simultaneous combination of trees and/or shrubs, usually nitrogen-fixing species, banded interspersed with annual crops. Trees or shrubs are pruned regularly to-use biomass as green manure and/or firewood, with the main objective of improving soil fertility and/or quality fodder. This system also promotes the use of green manure (Sullivan, 2003).

Onion (*Allium cepa* L., from Latin *cepa* "onion"), also known as the bulb onion or common onion, is a vegetable and is the most widely cultivated species of the genus *Allium*. It belongs to Family Amaryllidaceae Its close relatives include the garlic, shallot, leek, chive, and Chinese onion. The onion is most frequently a biennial or a perennial plant, but is usually treated as an annual and harvested in its first growing season. In the autumn (or in spring, in the case of overwintering onions), the foliage dies down and the outer layers of the bulb become dry and brittle. The crop is harvested and dried and the onions are ready for use or storage. The crop is prone to attack by a number of pests and diseases, particularly the onion fly, the onion eelworm, and various fungi cause rotting. Some varieties of *A. cepa*, such as shallots and potato onions, produce multiple bulbs (Fritsch et al., 2002). Onions are cultivated and used around the world. As a food item, they are usually served cooked, as a vegetable or part of a prepared savoury dish, but can also be eaten raw or used to make pickles or chutneys. They are pungent when chopped and contain certain chemical substances which irritate the eyes. Most onion cultivars are about 89% water, 4% sugar, 1% protein, 2% fibre, and 0.1% fat. Onions contain low amounts of essential nutrients (right table), are low in fats, and have an energy value of 166 kJ (40 kcal) per 100 g (3.5 oz). Freshly cut onions often cause a stinging sensation in the eyes of people

nearby, and often uncontrollable tears. This is caused by the release of a volatile gas, *sulphur dioxide* (Block et al., 2010).

Fertilizers enhance the growth of plants. This goal is met in two ways, the traditional one being additives that provide nutrients. The second mode by which some fertilizers act is to enhance the effectiveness of the soil by modifying its water retention and aeration. This article, like many on fertilizers, emphasises the nutritional aspect. Fertilizers typically provide, in varying proportions.

Organic fertilizers are fertilizers derived from animal matter, animal excreta (manure), human excreta, and vegetable matter. The main "organic fertilizers" are peat, animal wastes, plant wastes from agriculture, and treated sewage sludge (biosolids). In terms of volume, peat is the most widely used organic fertilizer. This immature form of coal confers no nutritional value to the plants, but improves the soil by aeration and absorbing water. Animal sources include the products of the slaughter of animals. Bloodmeal, bone meal, hides, hoofs, and horns are typical components. Organic fertilizer usually contain fewer nutrients, but offer other advantages as well as being appealing to those who are trying to practice "environmentally friendly" farming (Heinrich et al., 2009).

Inorganic fertilizer may seem to suggest that the fertilizer is not natural. This type of fertilizer actually also contains natural compounds. The difference is that the formula is put together in a refinery, rather than composed by nature as it occurs with organic fertilizers. Inorganic fertilizer also contains beneficial chemical and mineral deposits and supplies the nutrients necessary to grow plants (Dittmar et al., 2009). Farmyard manure refers to the decomposed mixture of dung and urine of farm animals along with litter and left over material from roughages or fodder fed to the cattle. On an average well decomposed farmyard manure contains 0.5 per cent N, 0.2 per cent P_2O_5 and 0.5 per cent K_2O (Reddy, 1995). Poultry Manure is the excreta of birds ferment very quickly. If left exposed, 50

percent of its nitrogen is lost within 30 days. Poultry manure contains higher nitrogen and phosphorus compared to other bulky organic manures. The average nutrient content is 3.03 per cent N; 2.63 per cent P₂O₅ and 1.4 per cent K₂O. The information on the aspects of Subabul based Agroforestry system involving various organic and inorganic fertilizers on the growth and yield of onion was limited so the study was undertaken.

MATERIALS AND METHODS

The present investigation was conducted at the Research and Nursery of College of Forestry, Sam Higginbottom University of Agricultural, Technology & Sciences, Prayagraj (U.P) during the period November 2016 to March 2017.

Climate and weather conditions:

Prayagraj is situated at an elevation of 25.26⁰ N, 81.54⁰ E, and 98 m above the mean sea

level. It is located in the south-eastern part of Uttar Pradesh and has tropical to subtropical climate with extremes of summer and winter. During winter months especially Dec-Jan temperature drops down to as low as 5⁰C while in summer temperature reached above 45⁰C. Hot scorching winds (commonly known as Loo) is regular feature during the summer where as there may be an occasional spell of frost during the winter. The annual rainfall is 1100 mm mostly during the monsoon autumn i.e July- Sept. with a few occasional showers during winter (Maurya et al., 2016).

Meteorological data:

The weekly average data on weather conditions during the experimental period was recorded at the Metrological observatory, which is located at Sam Higginbottom University of Agriculture, Technology and Sciences, Prayagraj, Uttar Pradesh.

Table 1: Weekly meteorological data (based on average of one week) collected during the cropping period from November 2016 to March 2017 is given below

Month	Week	Temperature (°C)		Relative humidity (%)		Rain fall (mm)
		Max.	Min.	Max.	Min.	
November 2016	Week I	33.68	18.57	91.14	55.85	0
	Week II	32.94	17.91	91.85	56.42	0
	Week III	32.37	15.88	91.57	50.28	0
	Week IV	31.65	15.2	92	46.42	0
December 2016	Week I	25.57	15.37	94.28	69.71	0
	Week II	22.77	12.22	94.71	58.57	0
	Week III	26.42	11.6	93.28	48.28	0
	Week IV	24.85	10.42	90.71	52.42	0
January 2017	Week I	19.65	9.11	91.57	60.85	0
	Week II	23.91	8.14	91.57	60.85	0
	Week III	24.42	9.71	91	45.57	0
	Week IV	27.82	11.85	90.28	41.57	0
February 2017	Week I	28.05	12.02	92.42	43.57	0
	Week II	29.4	12.31	88.57	41.85	0
	Week III	31.02	11.77	81.85	38.42	0
	Week IV	32.8	13.11	76.28	37.71	0
March 2017	Week I	33.68	13.2	77.57	37.14	0
	Week II	35.08	17.54	89	43.14	0
	Week III	36.48	17.45	86.14	38.28	0
	Week IV	38.6	27	84	36.42	0

Soil Analysis

The mechanical and chemical analysis of soil from the experimental fields was done to know

the fertility status and composition of soil, their procedure followed is mentioned as follows.

Table 2: Physical and chemical properties of soil of experiment field at the time of sowing

Particulars	Analyzed Value	Methods employed
Sand %	58%	International pipette method (Piper , 1950)
Silt %	24%	
Clay %	18%	
Soil texture	Sandy loam	
Organic carbon (%)	0.45	Walkley and Black, (1927)
Available nitrogen (Kgha ⁻¹)	221	Alkaline permanganate method of (Subbiah and Asija, 1956)
Available phosphorus (Kgha ⁻¹)	22.5	Olsen's colorimeter methods, (1954)
Available potassium (Kgha ⁻¹)	358	Flame Photometric method (Toth and Prince, 1949)
Soil pH 1:2 soil water suspension (w/v)	7.8	Digital pH (Jackson, 1954)
Ec (dSm ⁻¹)1:2 water suspension (w/v)	0.48	Digital conductivity meter (Jackson, 1954)

Fertilizers and Crop variety used

The different organic and inorganic fertilizers under Subabul formed the materials for this investigation. The study was conducted under 6 year's old Subabul plantations. Whereas, Onion was selected for this experiment. Under good management practices the Onion yields 25 t/ha and is resistant to all diseases. The Onion variety Nasik N-53 was taken for the study.

The field experiment was conducted by using Randomized Block Design (RBD) comprising of one variety and ten fertilizers levels (organic and inorganic), thereby making 10 treatments combinations, with three replication. Treatment combinations details as follow T₁-100% NPK, T₂-100% Poultry manure ,T₃-100% FYM, T₄- 50% NPK + 50% Poultry manure, T₅-50% NPK +50% FYM, T₆- 75% NPK + 25% Poultry manure, T₇-75% NPK + 25% FYM, T₈-25% NPK + 75% Poultry manure , T₉ -25% NPK + 75% FYM, T₁₀ -50% NPK + 25% Poultry manure + 25% FYM.

Land preparation and sowing

Details of different culture operations, land preparation to harvest was prepared by ploughing once with the help of tractor driven disc plough. Thereafter field was harrowed twice and leveled. The fertilizer as per treatment was broadcasted uniformly in each

plot before sowing and mixed thoroughly with the help of spade in upper soil layer. Crop was sown manually in the furrows at a planting geometry as per treatments.

Post planting operation:

Various planting operations i.e inter-culture operation were carried out when required to raise a healthy crop.

Weeding:

Three weeding operations were performed manually with the help of khurpi, between 45-72 days, 75-90 days and 105-120 days after sowing to keep the field free from weeds.

Observation recorded

The data of five randomly selected plants in each treatment replication from each replication was taken and calculated their average.

Pre harvesting

Plant height (cm), Neck thickness (cm), Leaf length (cm), Number of leaves.

Post harvesting

Weight of bulb (g), Bulb diameter (cm), Bulb height (cm), Bulb yield per plot (Kg/plot), Bulb yield per hectare (t/ha).

The experiment was laid out in Randomized Block Design having 10 treatments with each replicated thrice time. The data was recorded during the course of investigation were subjected to statistical analysis as per method of analysis of Variance, (ANOVA). The

significant and non-significant of the treatment effect were judged with the help of 'F' variance ratio test. Calculated 'F' value (Variance ratio) was compared with the tabulated value of 'F' at 5% levels of significance. If calculated value exceeded the tabulated value, the effect was considered to be significant, otherwise the effect is considered the non-significant. The significant difference between the mean was tested against the critical difference at 5% level of significance (Gomez & Gomez, 1984).

RESULTS AND DISCUSSION

The result and the data studied during investigation on the effect of organic and inorganic fertilizer on the growth and yield of onion under Subabul based Agroforestry system.

Plant height

At 30 DAT, the application of different level of organic and inorganic fertilizers significantly increase the plant height of the crop and also observed that the fertilizer doses of T₆ (75% NPK+25% PM) has increased the plant height of the crop followed by T₇ (75% NPK+25% FYM) over the recommended doses of onion i.e. T₁ (100% NPK). Among the various organic and inorganic fertilizer levels, T₆ (75% NPK+25% PM) produces the maximum plant height (29.393 cm) and T₃ (100% FYM) produces the minimum plant height (17.8 cm) under Subabul based Agroforestry system. At 60 DAT, the application of different level of organic and inorganic fertilizers significantly increase the plant height of the crop and also observed that the fertilizer doses of T₆ (75% NPK+25% PM) has increased the plant height of the crop followed by T₇ (75% NPK+25% FYM) over the recommended doses of onion i.e. T₁ (100% NPK). Among the various organic and inorganic fertilizer levels, T₆ (75% NPK+25% PM) produces the maximum plant height (54.06 Cm) and T₃ (100% FYM) produces the minimum plant height (35.233 cm) under Subabul based Agroforestry system. At 90 DAT, the application of different level of organic and inorganic fertilizers significantly

increase the plant height of the crop and also observed that the fertilizer doses of T₆ (75% NPK+25% PM) has increased the plant height of the crop followed by T₇ (75% NPK+25% FYM) over the recommended doses of Onion i.e. T₁ (100% NPK). Among the various organic and inorganic fertilizer levels, T₆ (75% NPK+25% PM) produces the maximum plant height (57.54 cm) and T₃ (100% FYM) produces the minimum plant height (44.373 cm) under Subabul based Agroforestry system. Similar results in case plant height found significantly higher (66.86 cm) were reported by Kumar et al. (2015), in Linseed in teak based Agroforestry system. Innatemsu et al. (2020) reported a maximum vine length 7.33 cm at DAS in Bottle gourd under Teak based Agroforestry system (Table 3).

Neck thickness

At 30 DAT, the application of different level of organic and inorganic fertilizers significantly increase the neck thickness of the crop and also observed that the fertilizer doses of T₆ (75% NPK+25% PM) has increased the Neck thickness of the crop followed by T₇ (75% NPK+25% FYM) over the recommended doses of onion i.e. T₁ (100%NPK) Among the various organic and inorganic fertilizer levels, T₆ (75% NPK+25% PM) produces the maximum neck thickness (0.633 cm) and T₃ (100% FYM) produces the minimum neck thickness (0.363 cm) under Subabul based Agroforestry system. At 60 DAT, the application of different level of organic and inorganic fertilizers significantly increase the neck thickness of the crop and also observed that the fertilizer doses of T₆ (75% NPK+25% PM) has increased the Neck thickness of the crop followed by T₇ (75% NPK+25% FYM) over the recommended doses of onion i.e. T₁ (100%NPK). Among the various organic and inorganic fertilizer levels, T₆ (75% NPK+25% PM) produces the maximum neck thickness (0.823 cm) and T₃ (100% FYM) produces the minimum neck thickness (0.500 cm) under Subabul based Agroforestry system. At 90 DAT, the application of different level of organic and inorganic fertilizers significantly increase the

neck thickness of the crop and also observed that the fertilizer doses of T₆ (75% NPK+25% PM) has increased the Neck thickness of the crop followed by T₇ (75% NPK+25% FYM) over the recommended doses of onion i.e. T₁ (100%NPK). Among the various organic and inorganic fertilizer levels, T₆ (75% NPK+25%

PM) produces the maximum neck thickness (1.383 cm) and T₃ (100% FYM) produces the minimum neck thickness (0.890 cm) under Subabul based Agroforestry system. The results were in concurrence with the findings of Thongney et al. (2020) in Cucumber with Citrus based Agroforestry system.

Table 3: Plant height (cm) and Neck thickness (cm) of onion (*Allium cepa*) on different level of fertilizers under Subabul based Agroforestry system at 30, 60 & 90 DAT

Treatments	Plant height (cm)			Neck thickness (cm)		
	30 DAT	60DAT	90DAT	30 DAT	60DAT	90DAT
T ₁	21.62	44.34	53.967	0.613	0.793	1.19
T ₂	20.533	35.97	49.467	0.423	0.527	1.043
T ₃	17.8	35.233	44.373	0.363	0.5	0.89
T ₄	24.95	48.58	52.28	0.57	0.78	1.19
T ₅	25.473	46.747	49.627	0.587	0.74	1.207
T ₆	29.393	54.06	57.54	0.633	0.823	1.383
T ₇	29.337	53.267	56.687	0.613	0.813	1.273
T ₈	23.637	39.82	49.177	0.517	0.713	1.223
T ₉	20.613	39.773	44.54	0.477	0.65	1.043
T ₁₀	18.36	44.973	45.527	0.44	0.653	1.087
F test	S	S	S	S	S	S
SE(d)	1.487	1.999	2.582	0.034	0.067	0.078
C.D. at (5%)	3.149	4.232	5.467	0.073	0.142	0.165

Leaf length

At 30 DAT, the application of different level of organic and inorganic fertilizers significantly increase the leaf length of the crop and also observed that the fertilizer doses of T₆ (75% NPK+25% PM) has increased the leaf length of the crop followed by T₇ (75% NPK+25% FYM) over the recommended doses of onion i.e. T₁ (100%NPK). Among the various organic and inorganic fertilizer levels, T₆ (75% NPK+25% PM) produces the maximum leaf length (26.33 cm) and T₃ (100% FYM) produces the minimum Leaf length (16.273 Cm) under Subabul based Agroforestry system. At 60 DAT, the application of different level of organic and inorganic fertilizers significantly increase the leaf length of the crop and also observed that the fertilizer doses of T₆ (75% NPK+25% PM) has increased the leaf length of the crop followed by T₇ (75% NPK+25% FYM) over the recommended doses of onion i.e. T₁ (100%NPK). Among the various organic and

inorganic fertilizer levels, T₆ (75% NPK+25% PM) (Table.2) produces the maximum leaf length (48.99 Cm) and T₃ (100% FYM) produces the minimum Leaf length (32.593 Cm) under Subabul based Agroforestry system. At 90 DAT, the application of different level of organic and inorganic fertilizers significantly increase the leaf length of the crop and also observed that the fertilizer doses of T₆ (75% NPK+25% PM) has increased the leaf length of the crop followed by T₇ (75% NPK+25% FYM) over the recommended doses of onion i.e. T₁ (100% NPK). Among the various organic and inorganic fertilizer levels, T₆ (75% NPK+25% PM) produces the maximum leaf length (49.707 cm) and T₃ (100% FYM) produces the minimum Leaf length (39.720 cm) under Subabul based Agroforestry system. Similar findings were reported in Cucumber under Citrus based Agroforestry System (Thongney et al., 2018).

Table 4: Leaf length and Number of leaves (cm) of onion (*Allium cepa*) on different level of fertilizers under Subabul based Agroforestry system at 30, 60 & 90 DAT

Treatments	Leaf length (Cm)			Number of leaves		
	30 DAT	60DAT	90DAT	30 DAT	60DAT	90DAT
T ₁	19.64	40.713	47.913	2.967	4.2	7.2
T ₂	18.08	32.593	44.487	2.933	3.933	7.4
T₃	16.273	32.593	39.72	2.8	3.933	6.8
T ₄	22.667	44.307	46.927	3.133	4.6	7.867
T ₅	23.307	42.62	44.107	3.267	4.467	7.933
T₆	26.33	48.99	49.707	3.933	4.8	8.867
T ₇	26.14	48.41	48.22	3.867	4.8	8.267
T ₈	21.933	35.747	44.013	3.467	4.6	8.067
T ₉	18.853	35.82	41.087	3.333	4.733	7.933
T ₁₀	16.673	39.763	39.953	3.133	4.733	7.467
F test	S	S	S	S	S	NS
SE(d)	1.361	1.819	2.734	0.285	0.301	-
C.D. at (5%)	2.882	3.851	5.789	0.603	0.637	-

Number of leaves

At 30 DAT, the application of different level of organic and inorganic fertilizers significantly increase the number of leaves of the crop and also observed that the fertilizer doses of T₆ (75% NPK+25% PM) has increased the number of leaves of the crop followed by T₇ (75% NPK+25% FYM) over the recommended doses of onion i.e. T₁ (100%NPK).

Among the various organic and inorganic fertilizer levels, T₆ (75% NPK+25% PM) produces the maximum number of leaves (3.933) and T₃ (100% FYM) produces the minimum number of leaves (2.8) under Subabul based Agroforestry system. At 60 DAT, the application of different level of organic and inorganic fertilizers significantly increase the number of leaves of the crop and also observed that the fertilizer doses of T₆ (75% NPK+25% PM) has increased the number of leaves of the crop followed by T₇ (75% NPK+25% FYM) over the recommended doses of onion i.e. T₁ (100%NPK). Among the various organic and inorganic fertilizer levels, T₆ (75% NPK+25% PM) produces the maximum number of leaves (4.80) and T₃ (100% FYM) produces the minimum number of leaves (3.933) under Subabul based agroforestry system. At 90

DAT, the application of different level of organic and inorganic fertilizers significantly increase the number of leaves of the crop and also observed that the fertilizer doses of T₆ (75% NPK+25% PM) has increased the number of leaves of the crop followed by T₇ (75% NPK+25% FYM) over the recommended doses of onion i.e. T₁ (100%NPK). Among the various organic and inorganic fertilizer levels, T₆ (75% NPK+25% PM) produces the maximum number of leaves (8.867) and T₃ (100% FYM) produces the minimum number of leaves (6.8) under Subabul based Agroforestry system. The results were in conformity with the findings of Khare et al. (2016) were they reported application of organic manure (50% FYM+ 50% Vermicompost maximized the soyabean growth and yield under Subabul based Agroforestry system. Agroforestry offers partial shade high organic moist soil, moderate temperature and high relative humidity which are ideal for crop growth (Kar et al., 2020).

Bulb Weight

It was observed that, the application of different level of organic and inorganic fertilizers significantly increase the bulb weight of the crop and also observed that the fertilizer doses of T₆ (75% NPK+25% PM) has increased the bulb weight of the crop followed

by T₇ (75% NPK+25% FYM) over the recommended doses of onion i.e. T₁ (100%NPK). Among the various organic and inorganic fertilizer levels, T₆ (75% NPK+25% PM) produces the maximum bulb weight (73.977 g) and T₃ (100% FYM) produces the minimum bulb weight (29.217 g) under Subabul based Agroforestry system (Table.4).

Bulb diameter

The application of different level of organic and inorganic fertilizers significantly increase the bulb diameter of the crop and also

observed that the fertilizer doses of T₆ (75% NPK+25% PM) has increased the bulb diameter of the crop followed by T₇ (75% NPK+25% FYM) over the recommended doses of onion i.e. T₁ (100% NPK). Among the various organic and inorganic fertilizer levels, T₆ (75% NPK+25% PM) produces the maximum bulb diameter (5.323 Cm) and T₃ (100% FYM) produces the minimum bulb diameter (3.647 Cm) under Subabul based Agroforestry system.

Table5. Bulb weight (g), Bulb diameter of onion (*Allium cepa*) on different level of fertilizers under

Treatments	Bulb weight (g)	Bulb dia. (cm)	Bulb height (cm)	Total Bulb yield per plot (Kg/plot)	Total Bulb yield per ha. (t/ha)
T ₁	57.193	4.990	5.387	8.573	21.443
T ₂	33.047	3.900	4.853	4.95	12.39
T₃	29.217	3.647	4.607	4.377	10.95
T ₄	64.08	4.710	5.743	9.607	24.027
T ₅	53.747	5.247	5.393	8.053	20.15
T₆	73.977	5.323	6.030	11.09	27.737
T ₇	65.637	5.310	5.790	9.837	24.61
T ₈	50.043	4.500	5.633	7.5	18.763
T ₉	47.11	4.637	4.950	7.06	17.653
T ₁₀	48.34	4.653	5.650	7.247	18.12
F test	S	S	S	S	S
SE(d)	2.686	0.316	0.25	0.403	1.007
C.D. at (5%)	5.687	0.668	0.53	0.854	2.132

Subabul based Agroforestry system

Bulb height

The application of different level of Organic and inorganic fertilizers significantly increase the bulb height of the crop and also observed that the fertilizer doses of T₆ (75% NPK+25% PM) has increased the bulb height of the crop followed by T₇ (75% NPK+25% FYM) over the recommended doses of Onion i.e. T₁ (100% NPK). Among the various organic and inorganic fertilizer levels, T₆ (75% NPK+25% PM) produces the maximum bulb height (6.03 cm) and T₃ (100% FYM) produces the minimum bulb height (4.607 cm) under Subabul based Agroforestry system (Table.5).

Total bulb yield per plot

It was observed that, the application of different level of organic and inorganic fertilizers significantly increase the total bulb yield per plot of the crop and also observed

that the fertilizer doses of T₆ (75% NPK+25% PM) has increased the total bulb yield per plot of the crop followed by T₇ (75% NPK+25% FYM) over the recommended doses of onion i.e. T₁ (100% NPK). Among the various organic and inorganic fertilizer levels, T₆ (75% NPK+25% PM) produces the maximum total bulb yield per plot (11.09 kg) and T₃ (100% FYM) produces the minimum total bulb yield per plot (4.377 kg) under Subabul based Agroforestry system.

Total Bulb yield per hectare

It was observed that, the application of different level of organic and inorganic fertilizers significantly increase the total bulb yield per hectare of the crop and also observed that the fertilizer doses of T₆ (75% NPK+25% PM) has increased the total bulb yield per hectare of the crop followed by T₇ (75%

NPK+25% FYM) over the recommended doses of onion i.e. T₁ (100% NPK). Among the various organic and inorganic fertilizer levels, T₆ (75% NPK+25% PM) produces the maximum total bulb yield per hectare (27.737 t) and T₃ (100% FYM) produces the minimum total bulb yield per hectare (10.95 t) under Subabul based Agroforestry system. The results indicate the crop growth with interspaced with organic and inorganic fertilizers is benefited from it. It also provides overall growth of crop and crop yield of Maize under Subabul based Agroforestry System (Yadav et al., 2019).

CONCLUSION

In the view of experimental findings it may be concluded that among 10 treatment combinations at different level of organic and inorganic fertilizers, treatment T₆ (75% NPK+25% PM) emerged as the best as compared to the other fertilizer levels with regard to its growth and yield under Subabul based agroforestry system. Hence, variety “Nasik N-53” of onion with fertilizer level 75% NPK+25% PM (NPK 82.5:30:45 Kg/ha.+1.875 t/ha.) is highly recommended for cultivation under Subabul based Agroforestry system during Rabi season in Prayagraj condition.

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