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Studies on Effect of Fertilizers and Pesticide on Growth and Yield of Strawberry (*Fragaria* x *ananassa* Duch.) cv. Shimla Delicious

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Abstract: **A field study was conducted in Department of Fruit Science (Horticulture), Bharsar, Uttarakhand during 2014-15 to Studies on effect of fertilizers and pesticide on growth, yield of strawberry (Fragaria x ananassa Duch.) cv. Shimla Delicious. The data regarding the different growth parameters observed at different days after planting clearly indicate that the application of fertilizer and pesticide significantly affect the vegetative growth of the plant. The maximum growth in terms of height of the plant (10.83cm, 13.83 cm and 18.13 cm), number of leaves per plant (15.34, 19.44, and 28.49), fruit length (31.60 mm), fruit breadth (19.50 mm), number of fruit per plant (15.62), days to fruit maturity (36.34 days), number of runners per plant (13.61), berry weight (5.43 g), yield per plant (84.89 g), and yield per hectare were observed in treatment combination 100:80:60 kg/ha NPK + vermicompost + runners dip with imidacloprid. The least values were recorded in the treatment F4xP3 (No application of fertilizer and pesticides).**

Keywords: **Fertilizers and Pesticide, Shimla Delicious, Fruit Science (Horticulture).**

1. INTRODUCTION

The cultivated strawberry *Fragaria* × *ananassa* (Duch.) is a man made hybrid of the *Fragaria chiloensis* (L.) and *Fragaria virginiana* (Duch.), is a member of the family Rosaceae, sub-family Rosoideae. Strawberry is delicious, refreshing, nutritious soft fruit with a distinct tantalizing aroma. The name "strawberry" may have derived from the practice of using straw mulch for cultivation, or it may have come from the Anglo-Saxon word strew, meaning to spread. It is the most widely distributed fruit crop due to its genotypic diversity, highly heterozygous nature and broad range of environmental adaptations (Larson, 1994; Childer *et al*., 1995). Now a day, it is commercially cultivated under the sub tropical, high altitude, tropical regions and even in desert areas. It is a herbaceous perennial plant, cherished in gardens and commercial fields (Sharma and Yamdagni, 2000), now it becomes an important table fruit as it not only tastes extremely delicious, it has nutritional value within itself, rich source of vitamins A, B, C and niacin, minerals like phosphorus, potassium, calcium and iron (Karkara and Dwivedi, 2002). Nitrogen (N) is the most absorbed plant nutrient; this nutrient is an essential component of basic structures in all plant species and its deficiency can severely effect growth and development. Phosphorus being the constituent of various nucleoproteins, enzymes and lipids, play a vital role in the formation of new cells and promotion of root growth (Salisbury and Rose, 1986). Vermicompost are organic materials broken down by interactions between micro-organism and earthworms in a mesophilic process, to produce fully stabilized organic soil amendments with low C: N ratio (Ramasamy *et al.*, 2011). Vermicompost comprises considerable quantities of nutrients, huge valuable microbial population and biologically active metabolites (gibberellins, cytokinins, auxins) and vitamins B which can be applied alone or in combination with other inorganic or organic fertilizers to get better quality of crops (Atiyeh *et al.*, 2002; Arancon *et al.*, 2006). Vermicompost is responsible for maintaining fertility of soil because of minerals contained in it converted to such forms (nitrates, exchangeable phosphorous, soluble potassium, calcium, manganese etc) that could be readily taken up by plants. The imidacloprid mainly used for seed and soil treatment, and

also be directly applied to plant foliage. They protect the plant from insect pests, such as aphids, leafhoppers, and whiteflies (Tomizawa and Casida, 2005). Our study was conducted for evaluation for impact of fertilizers and pesticides on growth and yield of strawberry because some pesticides act as plant growth regulators.

2. MATERIALS AND METHODS

The present investigation was carried out at the research farm of the Department of Fruit Science, Uttarakhand University of Horticulture and Forestry, Bharsar, Uttarakhand, India during year 2014-15. The site is located at an altitude of 1900 meters above mean sea level at a Longitude of 78.99^0 E and Latitude of 30.056^0 N. The climate of Bharsar is mild summer, higher precipitation and colder or severe cold prolonged winter. The South-east monsoon commences towards the end of June while the North-east monsoon causes occasional winter showers during November-February. During winter, snow fall is common in this region. The experiment included 12 treatments resulted from the combination between four fertilizer doses and three pesticides application methods with three replications. Recommended amount of fertilizers and manures *viz.*, Urea, MOP, SSP, vermicompost, applied before transplanting as per the treatment and mixed thoroughly in the soil. Imidacloprid 17.8 SL was used as runners dip method and foliar application. For runners dip method 3 ml imidacloprid was diluted in 1 liter of water the selected runners were dipped for 30 minute after that drained in shade and used for transplanting, foliar application (0.01 %) concentrations was used. Fertilizers doses *viz.*, F_1- NPK + vermicompost (100:80:60 kg/ha +2.5 tonnes), F_2- NPK+ Vermicompost (75:60:45 kg/ha+2.5 tonnes), F_3- NPK+ Vermicompost (50:40:30 kg/ha +2.5 tonnes), F_4- No application of fertilizer, pesticides application *viz.*, P_1- Runners dip method with imidacloprid, P_2- Foliar application of imidacloprid, P_3- No application of pesticide. The strawberry runners of uniform size were transplanted 2-5 cm depth at a spacing of 30×30 cm in second week of October. The observations on plant height (cm), number of leaves fruit length (mm), fruit breadth (mm) each at 60, 120 and 180 days interval, number of fruits per plant, days to fruit maturity, number of runners per plant, berry weight (g), yield per plant (g), and yield per hactare were recorded. The statistical analysis was carried out for each observed character by using MS-Excel, OPSTAT and SPAR 1.0 packages. The mean values of data were subjected to analysis of variance as described by Gomez and Gomez (1984) for Factorial Randomized Block Design.

3. RESULT AND DISCUSSION

3.1 Plant height:

Data on plant height after 60 days showed that maximum (10.46 cm) was recorded with F1 (100:80:60 kg NPK + vermicompost) (table 1). The increase in plant height might be due to integrated nutrient management *i.e.* inorganic and organic sources of nutrients. The results are in conformity with Nazir *et al.* (2006), Singh *et al.* (2010) and Umar *et al.* (2008) where, they observed that the integrated nutrient management was better than the single application of nutrients. Similarly, maximum plant height (9.55 cm) was recorded in treatment P1 (runners dip method with imidacloprid), the results are in conformity with Palumbo and Sanchez 1984, they observed that the imidacloprid protect crop by insect pest. The interaction study showed significant differences among the treatment in which maximum plant height (10.85 cm) was recorded in F1xP1 (100:80:60 kg NPK + vermicompost + runners dip method with imidacloprid). These results may be due to the role of nitrogen on chlorophyll synthesis, enzymes and proteins which in turn increases the vegetative growth. Lata *et al.* (2013) observed plant height (12.61 cm) after 60 days of planting with *Azotobactor* (50%) + *Azospirillum* (50%) + NPK (50%) + FYM. Similar findings are also obtained by Hargreaves *et al.* (2009), Awad *et al.* (2010) and Shehata *et al.* (2011).

The maximum plant height (13.20 cm) was recorded in treatment F1 (100:80:60 kg NPK + vermicompost) (table 2). The above findings are in close conformity with the results reported by Lata *et al.* (2013). Similarly, maximum plant height (12.41 cm) was recorded in treatment P1 (runners dip method with imidacloprid). The results are also conformity with Palumbo and Sanchez, 1984.The interaction study showed significant differences among the treatments combinations in which maximum plant height (13.83 cm) was recorded in F1xP1 (RD 100:80:60 kg NPK + vermicompost + runners dip method with imidacloprid). The above findings are in close conformity with the results reported by Lata *et al.* (2013) and Morgan, (2006).

Data presented in Table 3 revealed that the maximum plant height (17.67 cm) was recorded in treatment F1 (100:80:60 kg NPK + vermicompost). Likewise, maximum plant height (16.21 cm) was recorded in treatment P1 (runners dip method

with imidacloprid). The interaction study showed significant differences among the treatment in which maximum plant height (18.13 cm) was noticed in F1xP1 (100:80:60 kg NPK + vermicompost + runners dip method with imidacloprid). Above findings are in close conformity with the results reported by Khalid *et al.* (2013), observed that maximum plant height (15.21cm) was recorded in application with FYM. While, plant height may be due to better uptake of nutrients like nitrogen which has a major role in increasing cell division and improving plant growth. Organic amendments improve vegetative growth characters in strawberry by increasing soil enzyme activity and improving soil aeration, Bhattacharyya *et al*. (2003).

3.2 Number of leaves per plant:

The data presented in table 4 clearly showed that the fertilizers and pesticide exhibited significant difference in number of leaves per plant. The maximum number of leaves (14.02) recorded in treatment F1 (100:80:60 kg NPK + vermicompost). These results are in line with those of Odongo *et al*. (2008). Likewise, maximum number of leaves (12.03) was recorded in treatment P1 (runners dip method with imidacloprid). The interaction study showed significant differences among the treatment combinations in which maximum number of leaves (15.34) was recorded in F1xP1 (100:80:60 kg NPK + vermicompost + runners dip method with imidacloprid). Above findings are in close conformity with the results reported by Kachwaya and Chandel (2015), observed that maximum number of leaves were recorded in recommended dose of NPK, and similar finding are also reported by Lata *et al.* (2013).

Maximum number of leaves (19.01) was recorded in treatment F1 (100:80:60 kg NPK + vermicompost) (table 5). Ogendo *et al*. (2008) reported that farm yard manure contained proportionate amount of potassium which promoted leaf growth and enhanced sugar accumulation. Similarly, maximum number of leaves (17.72) was recorded in treatment P1 (runners dip method with imidacloprid). The interaction study revealed significant differences among the treatment combinations in which maximum number of leaves (19.44) was recorded in F1x P1 (100:80:60 kg NPK + vermicompost + runners dip method with imidacloprid). The reason for increased number of leaves may be due to the production of plant growth regulators by NPK and FYM, which are absorbed by the roots. Better development of root system and the possibly synthesis of plant growth hormones like IAA, GA and cytokinins and direct influence of fertilizers might have caused increased in plant's vegetative growth parameters. These results are inconformity to that of Yadav *et al.* (2010) in strawberry**.**

Data on number of leaves showed that maximum (28.10) leaves were recorded in treatment F1 (100:80:60 kg NPK + vermicompost). Likewise, maximum number of leaves (25.01) was recorded in treatment P1 (runners dip method with imidacloprid). The interaction study exhibited significant differences among the treatment in which maximum number of leaves (28.49) was recorded in F1x P1 (100:80:60 kg NPK + vermicompost + runners dip method with imidacloprid) (Table 6). The results obtained are in confirmation with the findings of Yadav *et al.* (2010) and Verma and Rao, (2013) who reported that a combined application of biofertilizers, vermicompost with inorganic fertilizers significantly increased the number of leaves of strawberry. Plant growth and yield enhancement has been attributed to some insecticides by several other investigators Parrot *et al*., (1985) and Scott *et al*., (1985).

3.3 Fruit length (mm):

Increase in fruit size and weight with increasing level of NPK fertilizers, Thakur and Singh (2004) and Mahalakshmi *et al.* (2001). Similarly, Raina *et al*. (2011) also recorded higher fruit size and weight of fruits with 100 per cent of recommended dose of conventional fertilizers applied through fertigation. Highest fruit length (31.12 mm) was recorded in treatment F1 (100:80:60 kg NPK + vermicompost). Likewise, highest fruit length (29.19 mm) was noticed in treatment P1 (runners dip method with imidacloprid). The interaction study showed significant differences among the treatment in which maximum fruit length (31.60 mm) was recorded in F1xP1 (100:80:60 kg NPK + vermicompost + runners dip method with imidacloprid) (table 7).

3.4. Fruit breadth (mm):

The enhancements in fruit size and fruit volume by this treatment were mainly because of proper supply of nutrient and proper protection against insect pest. The interaction study showed significant differences among the treatment in which maximum Fruit breadth (19.50 mm) was recorded in F1x P1 (100:80:60 kg NPK + vermicompost + runners dip method with imidacloprid) (table 8). Similar findings were also reported by Arancon *et al*. (2004) and Rana and Chandel (2003) in strawberry.

3.5 Number of fruit per plant:

Table 9 showed maximum number of fruit (11.83) was recorded in treatment P1 (runners dip method with imidacloprid). The interaction study showed significant differences among the treatment in which maximum number of fruit per plant (15.62) was recorded in F1xP1 (100:80:60 kg NPK + vermicompost + runners dip method with imidacloprid). Similar results have been reported by Herencia *et al.* (2011), Jain *et al.* (2016) and Singh and Sharma (1970).

3.6 Days to fruit maturity from flowering:

Minimum days to fruit maturity (37.41 days) was recorded in treatment F1 (100:80:60 kg NPK + vermicompost) followed by F3 (38.61 days). Minimum days to fruit maturity (38.12 days) were recorded in treatment P2 (foliar application with imidacloprid). The interaction study showed significant differences among the treatment in which minimum days to fruit maturity (36.34 days) was recorded in F1xP1 (100:80:60 kg NPK + vermicompost + runners dip method with imidacloprid) (table 10). These results are closely related to the reports given by Chaturvedi *et al.* (2005).

3.7 Number of runners per plant:

Maximum runners per plant (12.45) recorded in treatment F1 (100:80:60 kg NPK + vermicompost). Similar results have been reported by Nazir *et al*. (2006) found maximum number of runners per plant (9.41) with the application of recommended dose of NPK. Likewise, maximum number of runners (11.92) were recorded in treatment P1 (runners dip method with imidacloprid). Whereas, minimum number of runners (10.51) was recorded in P3 (control)(table 11). Similar finding have been reported by, Chaturvedi *et al.* (2005) and Sharma (2002) in strawberry.

3.8 Average fruit weight (g):

Maximum berry weight (5.43 g) was recorded in F1xP1 (100:80:60 kg NPK + vermicompost + runners dip method with imidacloprid) (table 12). Similar findinding were reported by Magge (1963) in apples and Hansen (1969) in strawberry. The increase in fruit weight was also reported by Neuweiler *et al*. (1996) with the increasing nitrogen application in strawberry.

3.9 Yield per plant:

The data on yield per plant presented in table 13 showed that maximum yield 84.89 g/plant was recorded in treatment F1(100:80:60 kg NPK+ VC) and minimum in 25.98 g/plant F4 (No application). The interaction study showed significant differences among the treatment in which maximum yield per plant (84.89 g) was recorded in F1xP1 (100:80:60 kg NPK + vermicompost + runners dip method with imidacloprid). Similar results were also reported by Umar *et al*. (2008), Singh and Singh (2009), Singh *et al*. (2010) and Yadav *et al*. (2010) all reported the superiority of organic manure with the combinations of inorganic fertilizers in producing higher yields.

3.10 Yield per hectare (tonnes):

Present findings yield per plant are in close conformity with the results presented by Wani *et al*. (2015) reported that the combinations of organic and inorganic fertilizers in producing higher yields. The interaction study showed significant differences among the treatment in which maximum yield per hectare (9.43 tonnes) was recorded in F1xP1 (100:80:60 kg NPK + vermicompost + runners dip method with imidacloprid)(Table 14). Similar results were also reported by Gajbhiye *et al*. (2003) and Asrey and Singh (2004).

4. CONCLUSION

The maximum plant height, number of leaves, fruit length, fruit breadth at 60, 120 and 180 days after transplanting were recorded in treatment 100:80:60 kg/ha NPK + vermicompost (2.5 tonnes) + runners dip method with imidacloprid. Similarly, this treatment was also found superior for number of fruit, fruit maturity from flowering, number of runners per plant, average berry weight, yield per plant, and yield per hectare. However, minimum was recorded in treatment F4xP3 (No application of fertilizer and pesticides).

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APPENDIX - A

Table- 1: Effect of fertilizers and pesticide on plant height (cm) after 60 days of planting of strawberry cv. Shimla Delicious.

Pesticide / Fertilizers	P1-Runners dip in imidacloprid	P2-Foliar application	P3-No application	Mean F
F1-100:80:60 kg NPK+ VC	10.85 ± 0.26*	10.53 ±0.21	10.00 ± 0.23	10.46
F2 -75:60:45 kg NPK+ VC	9.55 ± 0.42	9.34 ± 0.21	8.43 ± 0.33	9.10
F3- 50:40:30 kg NPK+VC	9.45 ± 0.14	8.15 ± 0.11	8.60 ±0.28	8.73
F4-No application	8.33 ± 0.14	8.31 ± .021	6.70 ±0.23	7.78
Mean P	9.55	9.08	8.43	
	$CD_{(0.05)}$	SE(d)		
Fertilizers	0.40	0.19		
Pesticide	0.35	0.16		
Fertilizer x Pesticide	0.70	0.33		

*± Standard error of mean

Table-2: Effect of fertilizers and pesticide on plant height (cm) after 120 days of planting of strawberry cv. Shimla Delicious

Pesticide / Fertilizers	P1-Runners dip in imidacloprid	P2-Foliar application	P3-No application	Mean F
F1-100:80:60 kg NPK+ VC	13.83 ± 0.26*	13.42 ± 0.10	12.34 ± 0.40	13.20
F2 -75:60:45 kg NPK+ VC	12.34 ± 0.20	11.63 ± 0.00	11.05 ± 0.30	11.67
F3- 50:40:30 kg NPK+VC	11.72 ± 0.21	11.88 ± 0.38	11.31 ± 0.23	11.64
F4-No application	11.74 ± 0.29	10.52 ± 0.16	9.68 ± 0.24	10.65
Mean P	12.41	11.86	11.09	
	$CD_{(0.05)}$	SE(d)		
Fertilizers	0.39	0.19		
Pesticide	0.34	0.16		
Fertilizer x Pesticide	0.68	0.32		

* ± Standard error of mean

Table-3: Effect of fertilizers and pesticide on plant height (cm) after 180 days of planting of strawberry cv. Shimla Delicious

Pesticide / Fertilizers	P1-Runners dip in imidacloprid	P2-Foliar application	P3-No application	Mean F
F1-100:80:60 kg NPK+ VC	18.13 ± 0.14*	17.60 ± 0.12	17.30 ± 0.60	17.67
F2 -75:60:45 kg NPK+ VC	16.35 ± 0.27	15.71 ± 0.04	15.62 ± 0.20	15.89
F3- 50:40:30 kg NPK+VC	15.62 ± 0.20	15.26 ± 0.32	14.43 ± 0.09	15.10
F4-No application	14.74 ±0.10	14.33 ± 0.40	13.52 ± 0.09	14.19
Mean P	16.21	15.72	15.21	
	$CD_{(0.05)}$	SE (d)		
Fertilizers	0.48	0.23		
Pesticide	0.41	0.20		
Fertilizer x Pesticide	0.83	0.39		

* ± Standard error of mean

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Table-4: Effect of fertilizers and pesticide on number of leaves after 60 days of planting of strawberry cv. Shimla Delicious.

Pesticide / Fertilizers	P1-Runners dip in imidacloprid	P2-Foliar application	P3-No application	Mean F
F1-100:80:60 kg NPK+ VC	15.34 ± 0.23*	14.44 ± 0.25	12.28 ± 0.14	14.02
F2 -75:60:45 kg NPK+ VC	10.58 ± 0.17	12.41 ± 0.24	11.60 ± 0.04	12.47
F3- 50:40:30 kg NPK+VC	12.70 ± 0.14	11.52 ± 0.08	11.65 ± 0.11	11.96
F4-No application	9.4 ± 0.08	9.44 ± 0.15	8.68 ± 0.14	9.20
Mean P	12.03	11.95	11.76	
	$CD_{(0.05)}$	SE (d)		
Fertilizers	0.27	0.13		
Pesticide	0.23	0.11		
Fertilizer x Pesticide	0.47	0.22		

* ± Standard error of mean

Table-5: Effect of fertilizers and pesticide on number of leaves after 120 days of planting of strawberry cv. Shimla Delicious

Pesticide / Fertilizers	P1-Runners dip in imidacloprid	P2-Foliar application	P3-No application	Mean F
F1-100:80:60 kg NPK+ VC	19.44 ± 0.21*	19.24 ±0.10	18.34 ± 0.27	19.01
F2 -75:60:45 kg NPK+ VC	17.30 ± 0.53	17.22 ± 0.34	17.29 ± 0.52	17.27
F3- 50:40:30 kg NPK+VC	17.31 ± 0.24	17.13 ± 0.42	16.70 ± 0.17	17.05
F4-No application	16.82 ± 0.15	15.82 ± 0.54	14.22 ±0.02	15.62
Mean P	17.72	17.35	16.64	
	$CD_{(0.05)}$	SE (d)		
Fertilizers	0.59	0.28		
Pesticide	0.51	0.24		
Fertilizer x Pesticide	1.02	0.49		

* ± Standard error of mean

Table-6: Effect of fertilizers and pesticide on number of leaves after 180 days of planting of strawberry cv. Shimla Delicious

Pesticide / Fertilizers	P1-Runners dip in imidacloprid	P2-Foliar application	P3-No application	Mean F
F1-100:80:60 kg NPK+ VC	28.49 ± 0.08*	28.38 ± 0.25	27.43 ± 0.20	28.10
F2 -75:60:45 kg NPK+ VC	25.51 ± 0.17	24.17 ± 0.10	24.53 ± 0.27	24.74
F3- 50:40:30 kg NPK+VC	23.55 ± 0.27	23.50 ± 0.25	23.08 ± 0.08	23.37
F4-No application	22.50 ± 0.27	22.38 ± 0.12	21.46 ± 0.25	22.11
Mean P	25.01	24.61	24.12	
	$CD_{(0.05)}$	SE (d)		
Fertilizers	0.37	0.17		
Pesticide	0.32	0.15		
Fertilizer x Pesticide	0.64	0.31		

* ± Standard error of mean

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Table-7: Effect of fertilizers and pesticide on fruit length (mm) of strawberry cv. Shimla Delicious

Pesticide / Fertilizers	P1-Runners dip in imidacloprid	P2-Foliar application	P3-No application	Mean F
F1-100:80:60 kg NPK+ VC	31.60 ±0.17*	31.16 ± 0.29	30.59 ±0.13	31.12
F2 -75:60:45 kg NPK+ VC	29.39 ±0.09	28.37 ±0.10	28.45 ±0.09	28.73
F3- 50:40:30 kg NPK+VC	29.27 ±0.23	27.57 ±0.23	28.44± 0.08	28.43
F4-No application	26.49 ±0.22	26.47 ±0.18	25.41 ±0.05	26.12
Mean P	29.19	28.39	28.22	
	$CD_{(0.05)}$	SE (d)		
Fertilizers	0.26	0.12		
Pesticide	0.23	0.11		
Fertilizer x Pesticide	0.46	0.22		

* ± Standard error of mean

Table-8: Effect of fertilizers and pesticide on fruit breadth (mm) of strawberry cv. Shimla Delicious.

Pesticide / Fertilizers	P1-Runners dip in imidacloprid	P2-Foliar application	P3-No application	Mean F
F1-100:80:60 kg NPK+ VC	19.50 ± 0.49	18.73 ± 0.37	18.03 ± 0.37	18.75
F2 -75:60:45 kg NPK+ VC	17.96 ± 0.23	16.61 ± 0.15	16.06 ± 0.43	16.88
F3- 50:40:30 kg NPK+VC	16.33 ± 0.41	16.63 ± 0.35	17.56 ± 0.41	16.84
F4-No application	15.50 ± 0.60	14.60 ± 0.64	13.50 ± 0.11	14.53
Mean P	17.32	16.64	16.29	
	$CD_{(0.05)}$	SE (d)		
Fertilizers	0.69	0.33		
Pesticide	0.59	0.28		
Fertilizer x Pesticide	1.19	0.57		

* ± Standard error of mean

Table 9: Effect of fertilizers and pesticide on number of fruits per plant of strawberry cv. Shimla Delicious

Pesticide / Fertilizers	P1-Runners dip in imidacloprid	P2-Foliar application	P3-No application	Mean F
F1-100:80:60 kg NPK+ VC	15.62 ± 0.20*	14.41 ± 0.10	14.73 ± 0.06	14.92
F2 -75:60:45 kg NPK+ VC	12.60 ± 0.14	10.50 ± 0.21	11.54 ± 0.15	11.55
F3- 50:40:30 kg NPK+VC	10.64 ± 0.16	10.65 ± 0.15	9.31 ± 0.02	10.20
F4-No application	8.48 ± 0.24	8.34 ± 0.05	8.25 ± 0.04	8.36
Mean P	11.83	10.97	10.96	
	$CD_{(0.05)}$	SE (d)		
Fertilizers	0.26	0.12		
Pesticide	0.22	0.10		
Fertilizer x Pesticide	0.45	0.21		

* ± Standard error of mean

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Table 10: Effect of fertilizers and pesticide on days to fruit maturity of strawberry cv. Shimla Delicious

Pesticide / Fertilizers	P1-Runners dip in imidacloprid	P2-Foliar application	P3-No application	Mean F
F1-100:80:60 kg NPK+ VC	36.34 ± 0.11	37.31 ± 0.11	38.57 ± 0.05	37.41
F2 -75:60:45 kg NPK+ VC	39.59 ± 0.05	38.35 ± 0.10	38.38 ± 0.18	38.77
F3- 50:40:30 kg NPK+VC	40.42 ± 0.19	38.36 ± 0.10	37.04 ± 0.56	38.61
F4-No application	37.20 ± 0.11	38.47 ± 0.11	42.38 ± 0.14	39.35
Mean P	38.39	38.12	39.09	
	$CD_{(0.05)}$	SE (d)		
Fertilizers	0.35	0.16		
Pesticide	0.30	0.14		
Fertilizer x Pesticide	0.60	0.29		

* ± Standard error of mean

Table: 11: Effect of fertilizers and pesticide on number of runners per plant of strawberry cv. Shimla Delicious

Pesticide / Fertilizers	P1-Runners dip in imidacloprid	P2-Foliar application	P3-No application	Mean F
F1-100:80:60 kg NPK+ VC	13.61 ± 0.21*	10.65 ± 0.16	13.09 ± 0.06	12.45
F2 -75:60:45 kg NPK+ VC	12.39 ± 0.14	11.55 ± 0.18	10.53 ± 0.07	11.49
F3- 50:40:30 kg NPK+VC	11.36 ± 0.25	10.60 ± 0.20	10.03 ± 0.37	10.66
F4-No application	10.33 ± 0.33	9.41 ± 0.14	8.40 ± 0.13	9.38
Mean P	11.92	10.55	10.51	
	$CD_{(0.05)}$	SE (d)		
Fertilizers	0.32	0.15		
Pesticide	0.27	0.13		
Fertilizer x Pesticide	0.55	0.26		

* ± Standard error of mean

Table: 12- Effect of fertilizers and pesticide on average fruit weight (g) of strawberry cv. Shimla Delicious.

Pesticide / Fertilizers	P1-Runners dip in imidacloprid	P2-Foliar application	P3-No application	Mean F
F1-100:80:60 kg NPK+ VC	5.43 ± 0.08	5.29 ± 0.11	4.94 ± 0.01	5.22
F2 -75:60:45 kg NPK+ VC	5.29 ± 0.16	4.70 ± 0.12	4.64 ± 0.06	4.87
F3- 50:40:30 kg NPK+VC	4.62 ± 0.17	4.97 ± 0.11	4.26 ± 0.03	4.61
F4-No application	4.00 ± 0.12	3.70 ± 0.13	3.14 ± 0.01	3.61
Mean P	4.83	4.68	4.25	
	$CD_{(0.05)}$	SE (d)		
Fertilizers	0.19	0.09		
Pesticide	0.16	0.08		
Fertilizer x Pesticide	0.33	0.16		

* ± Standard error of mean

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Table: 13: Effect of fertilizers and pesticide on yield per plant (g) of strawberry cv. Shimla Delicious.

Pesticide / Fertilizers	P1-Runners dip in imidacloprid	P2-Foliar application	P3-No application	Mean F
F1-100:80:60 kg NPK+ VC	84.89 ± 2.39	76.21 ± 1.38	72.90 ± 0.49	78.00
F2 -75:60:45 kg NPK+ VC	66.17 ± 1.27	50.19 ± 2.20	53.62 ± 0.92	56.66
F3- 50:40:30 kg NPK+VC	48.08 ± 1.86	53.00 ± 1.53	39.69 ± 0.25	46.92
F4-No application	33.92 ± 0.97	30.94 ±1.26	25.98 ± 0.05	30.28
Mean P	58.27	52.58	48.04	
	$CD_{(0.05)}$	SE (d)		
Fertilizers	2.44	1.17		
Pesticide	2.11	1.01		
Fertilizer x Pesticide	4.23	2.03		

* ± Standard error of mean

Table: 14: Effect of fertilizers and pesticide on yield per hectare (tonnes) of strawberry cv. Shimla Delicious.

Pesticide / Fertilizers	P1-Runners dip in imidacloprid	P2-Foliar application	P3-No application	Mean F
F1-100:80:60 kg NPK+ VC	9.43 ± 0.26	8.47 ± 0.15	8.10 ± 0.05	8.66
F2 -75:60:45 kg NPK+ VC	7.35 ± 0.14	5.57 ± 0.24	5.96 ± 0.10	6.29
F3- 50:40:30 kg NPK+VC	5.34 ± 0.20	5.89 ± 0.17	4.41 ± 0.02	5.21
F4-No application	3.77 ± 0.11	3.44 ± 0.14	2.88 ± 0.01	3.36
Mean P	6.47	5.84	5.33	
	$CD_{(0.05)}$	SE (d)		
Fertilizers	0.27	0.13		
Pesticide	0.23	0.11		
Fertilizer x Pesticide	0.47	0.22		

* ± Standard error of mean