Journal of Pharmacognosy and Phytochemistry

Available online at www.phytojournal.com

E-ISSN: 2278-4136
P-ISSN: 2349-8234
www.phytojournal.com
JPP 2020; 9(5): 1799-1804
Received: 26-06-2020
Accepted: 10-08-2020

Bhuwan Chandra Sharma
Department of Plant Pathology, Collage of Agriculture, Govind Ballabh Pant University of Agriculture & Technology, Pantnagar, Udham Singh Nagar, Uttarakhand, India

Rajesh Pratap Singh
Professor, Department of Plant Pathology, Collage of Agriculture, Govind Ballabh Pant University of Agriculture & Technology, Pantnagar, Udham Singh Nagar, Uttarakhand, India

Amit Bhatnagar
Senior Research Officer, Department of Agronomy, Collage of Agriculture, Govind Ballabh Pant University of Agriculture & Technology, Pantnagar, Udham Singh Nagar, Uttarakhand, India

Corresponding Author:
Bhuwan Chandra Sharma
Department of Plant Pathology, Collage of Agriculture, Govind Ballabh Pant University of Agriculture & Technology, Pantnagar, Udham Singh Nagar, Uttarakhand, India

Effect of tillage and nutrient management practices on banded leaf and sheath blight of Maize

Bhuwan Chandra Sharma, Rajesh Pratap Singh and Amit Bhatnagar

Abstract
Banded leaf and sheath blight caused by *Rhizoctonia solani* fsp *sasakii* is highly destructive diseases of maize crop worldwide including India. Depending upon weather conditions they cause the significant yield reduction ranging from 11 to 40 % in maize crop. It is present in all tropical and temperate maize growing regions. Growing conditions creating hot and humid condition are most favourable for the development of the disease. Under tarai condition of Uttrakhand an experiment was carried out by integrating tillage practices like- permanent raised beds, zero tillage and conventional tillage along with different nutrient management approaches like- Recommended Dose of Fertilizers (RDF), Site Spesific Nutrient management (SSNM) and Farmer's practices (FP) for the management of maize diseases. Results of present study indicated that conventional tillage followed by permanent raised bed and zero tillage and in nutrient management SSNM followed by RDF management practices were found equally good with respect to diseases incidence and severity. Highest grain yield was recorded in permanent raised beds (5817 Kg/ha) while conventional tillage (5748 Kg/ha) was found at par with permanent raised beds. Minimum yield was recorded in zero tillage (5617 Kg/ha). Thousand grain weight in conventional tillage (306 g) and permanent beds (305 g) were at par, followed by zero tillage (282 g).

Keywords: Banded leaf and sheath blight, Tillage management, Nutrient management, Maize

Introduction
Maize is an important food crop which is affected by several diseases. These diseases are classified mainly on the basis of plant part affected. Among them stalk rots are considered as most serious as it affects flow of nutrients from root to upper plants parts and often whole plant either get dry or broken from the base resulting in huge yield losses. Banded leaf and sheath blight (BLSB), a soil-borne disease caused by *Rhizoctonia solani f. sp. sasakii* has been reported from several maize growing countries. It is more prevalent in humid weather with temperature of around 28 ^{0}C can completeiy wipeout the crop (Tang *et al.*, 2004) [17]. The pathogen spreads from the basal sheath to the developing ear under favorable environmental conditions. The developing ear is completely damaged and dries up prematurely with caking of husk leaves (Kumar and Singh, 2004) [7]. BLSB poses challenge to maize growers as it is not adequately controlled either through use of fungicides or crop rotation. No resistance sourse is available in maize against this disease therefore a combination of agronomical practices that manupulates the fevourable condition for disease development is required for BLSB control. The SSNM and STCR approaches not only aim to reduce or increase fertilizer use and also the effective tools for supplying crop nutrients as and when needed to achieve higher yield, besides this they also aims to increase system nutrient use efficiency, leading to more net returns per unit of fertilizer invested (Shankar and Umesh, 2008) [13]. Jayaprakash *et al.* (2006) [2] observed that grain yield increased significantly upto 150 per cent RDF, further increase in the levels upto 200 per cent RDF did not influenced significantly. Umesh (2008) [13] reported that among different treatment combinations application of SSNM and STCR approaches for a target yield of 8 t ha-1 and NAH-2049 recorded higher grain yield of maize as compared to other treatment combinations. Karami *et al.* (2012) [3] reported that the tillage has been an integrated component of all crops, mainly because it improves water holding capacity, increase aeration and also moderates soil hydraulic conditions. Khan *et al.* (2008) [5] observed that minimum tillage and conventional tillage had higher biomass and leaf area index. Nitrogen uptake was found consistently superior with MTRR (Minimum tillage with residue retention) compared to MTRV (Minimum tillage with residue removal) and CT (Conventional tillage) (Tolessa *et al.*, 2009) [18] Growth attributes of maize in bed planting was found significantly superior over rest of the tillage practices. Growth of maize under nutrient management practices, farmer practices was found significantly superior over RDF but statistically at par

With SSNM (Kumar *et al.*, 2018) [8]. Kumar and Kumar (2018) [8] reported that the Site-specific nutrient management, recommended dose of fertilizer, FIRBS and ridge bed planting may enhance better productivity as well as profitability of farmers against conventional planting in Indian scenario. Keeping in view the importance of this disease in the region an integrated strategy involving tillage practices and nutrient management practices like Recommended Dose of fertilizers, Site Specific Nutrient Management and Farmer's practices were evaluated for devising an integrated approach for the management of Banded leaf and sheath blight of maize under *tarai* conditions of Uttarakhand.

Material and Methods

Field experiment was conducted during *kharif* 2017 and 2018 in Maize Agronomy block at Norman E. Borlaug Crop Research Centre, G.B. Pant University of Agriculture and Technology, Pantnagar, Udham Singh Nagar, Uttarakhand. It has sub-tropical climate with hot and humid summer and cold winters. Field experiments were conducted using hybrid DH 296 to develop the integration of tillage and nutrient management practice for the management of maydis leaf blight of maize. Plot size was 3.0 meter x 4.00 m^2 with three replication of each treatment. Trail was laid out in split plot design with three types of tillage practices *viz*, Permanent Raised Beds (PRB), Zero tillage (ZT) and Conventional tillage (CT) as in main plot and three sub plot *viz*, Recommended Dose of fertilizers (RDF), Site Specific Nutrient Management (SSNM) and Farmer's practices (FP). The spacing was 60 cm × 25 cm. There were 5 rows in each plot. Permanent bed and zero tillage treatment were initiated in year 2012. Permanent bed were made at 60 cm with the help of tractor drawn FIRBS. These permanent beds were reshaped every year before sowing of maize. In permanent beds and zero tillage sowing was done manually. In conventional tillage there were four harrowing fallowed by leveling and sowing was done by tractor drown furrow opener. Recommended dose of nutrient was 120:60:40 N:P_2O_5:K_2O kg/ha. In farmer's practices treatment nutrient dose was 93: 64: 32N: P_2O_5:K_2O kg/ha. In Site specific nutrient management nutrient dose was calculated by a computer software programme developed by International Plant Nutrition Institute in India (Majumdar *et al*., 2013) [11] which came to 120:30:46 N: P_2O_5: K_2O kg/ha. In year 2017 crop was sown on 19th July and harvested on 2nd November while in 2018 sowing was done on 19th July and harvested on 29th October. Plots were hand weeded with the help of hoe regularly. Observations on disease severity were recorded at 40, 55, 70 and 85 days after sowing using 1-9 rating scale (Hooda *et al*., 2018) [1]. Per cent diseases Index (PDI) was calculate using formula given by Wheeler (1969) [20].

$$\text{PDI} = \frac{\text{Sum of all disese ratings}}{\text{Total no. of observation x Highest disease ratting scale}} x100$$

Data was statistically analyzed using online programme "OPSTAT" a Statistical Software Package for Agricultural Research Workers developed by Sheoran *et al*. (1998) [15].

Rating scale for Banded leaf & sheath blight (BL & SB) (Hooda *et al*., 2018) [1]

Scale	Degree of infection (% Diseased area in Plant)
1.	Disease on one leaf sheath only; few small, non-coalescent lesions present (≤10%).
2.	Disease on two sheaths; lesions large and coalescent (10.1-20%).
3.	Disease up to four sheaths; lesions many and always coalescent (20.1-30%).
4.	As in disease rating symptoms of 3.0, + rind discolored with small lesions (30.1-40%).
5.	Disease on all sheaths except two internodes blow the ear (40.1-50%).
6.	Disease up to one internode below ear shoot, rind discoloration on many internodes with large depressed lesions (50.1-60%).
7.	Disease up to the internodes bearing the ear shoot but shank not affected (60.1-70%).
8.	Disease on the ear; husk leaves show bleaching, bands and cracking among themselves as also silk fibers; abundant fungal growth between and on kernels; kernels formation normal except being lusterless; ear size less than normal; some plants prematurely dead (70.1-80%).
9.	In addition to disease rating symptoms of 8.0, shrinkage of stalk; reduced ear dimension; wet rot and disorganization of ear; kernel formation absent or rudimentary; prematurely dead plants common; abundant sclerotia production on husk leaves, kernels ear tips and silk fibers (>80%).

Results and Discussion

1.1 Effect of tillage practices on incidence of banded leaf and sheath blight

Banded leaf and sheath blight measured in terms of incidence at different interval showed that different tillage practices taken as main plot and different nutrient management practices as sub plots were significantly different but their interaction was found statistically non-significant (Table 1).

Effect of different tillage practices on banded leaf and sheath blight. 40 days after sowing, in the year 2017 significantly lowered incidence of banded leaf and sheath blight in conventional tillage (7.17 %) followed by permanent beds (9.80 %). Zero tillage (8.61 %) was at par with conventional tillage and permanent beds. Similar trend was recorded in 2018 lower disease incidence was 6.97 % in conventional tillage followed by 8.10 % zero tillage and 8.86 % permanent beds. On pooled basis too significantly lower incidence of banded leaf and sheath blight were observed in conventional tillage (7.06%) followed by zero tillage (8.36 %) and permanent beds (9.32 %).

Significantly lower disease incidence was recorded in conventional tillage (9.10 %) followed by zero tillage (11.48 %) and permanent beds (13.34 %). after 55 days of sowing, in the year 2017, while in 2018 significantly lower incidence of banded leaf and sheath blight were observed in conventional tillage (8.74%) followed by zero tillage (10.42 %) and permanent beds (11.84 %). On pooled basis significantly lower disease incidence was recorded in conventional tillage (8.93 %) followed by zero tillage (10.96 %) and permanent beds (12.59 %).

During the year 2017, 2018 and on pooled basis after 70 days of sowing significantly lower incidence of banded leaf and sheath blight was recorded in conventional tillage with 12.60, 11.33, 11.94 followed by zero tillage 15.66, 14.11, 14.88 followed by permanent beds 17.63, 16.30, 16.99 respectively, while after 85 days of sowing significantly lower incidence was observed in conventional tillage with 15.89, 14.50, 15.19

followed by zero tillage 19.49, 17.96, 18.72 and permanent beds 21.97, 20.71, 21.33 % percent, respectively. Zero tillage was at par with permanent beds.

1.2 Effect of tillage practices on severity of banded leaf and sheath blight

Disease severity measured in terms of Percent Disease Index (PDI) at different interval showed that different tillage practices taken as main plot and different nutrient management practices as sub plots were significantly different but their interaction was found non-significant (Table 2).

Effect of different tillage practices on banded leaf and sheath blight, after 40 days of sowing, in the year 2017 significantly minimized severity of banded leaf and sheath blight in conventional tillage (13.58 %) followed by permanent beds (15.80 %) and zero tillage (17.78 %). Similar trend was observed in 2018 and significantly lower disease severity was recorded in conventional tillage (16.54 %) followed by permanent beds (18.77 %) and zero tillage (20.74 %). On pooled basis also lower severity was recorded in conventional tillage (15.06 %) followed by permanent beds (17.29 %) and zero tillage (19.26 %).

Significantly lower disease severity were recorded in Conventional tillage (15.80 %) followed by permanent beds (18.03 %) and zero tillage (20.99 %) after 55 days of sowing, in the year 2017. In 2018 too significantly lower severity was observed in conventional tillage (18.77 %) and permanent beds (20.99 %) followed by zero tillage (23.95 %). Similar trend was found on pooled basis where lower severity was recorded in conventional tillage (17.58 %) followed by permanent beds (19.51 %), and Zero tillage (22.47 %).

During the year 2017, 2018 and on pooled basis after 70 days of sowing significantly lower disease severity of banded leaf and sheath blight was recorded in conventional tillage with 20.99, 23.21, 22.10 followed by permanent beds 22.96, 25.18, 24.07 and zero tillage 25.43, 27.90, 26.67 percent, respectively while after 85 days of sowing significantly lower severity was observed in conventional tillage with 26.91, 30.12, 28.52 followed by permanent beds 29.38, 33.09, 31.24 % and zero tillage 33.58, 38.02, 35.80 percent, respectively.

2.1 Effect of nutrient management practices on incidence of banded leaf and sheath blight.

Incidence of banded leaf and sheath blight recorded after 40 days of sowing in year 2017 was was at par in Recommended dose of fertilizer (7.93 %) and Site specific nutrient management (7.99 %), followed by Farmers practices (9.66 %). In 2018 lower incidence of banded leaf and sheath blight was recorded in Site specific nutrient management (7.48 %) which was at par with Recommended dose of fertilizer (7.54 %) followed by Farmers practices (8.90 %). Similarly on pooled basis (7.72 %) incidence of banded leaf and sheath blight was noticed in Recommended dose of fertilizer which was at par Site specific nutrient management (7.73 %), followed by (9.28 %) in Farmers practices. (Table 1)

After 55 days of sowing in year 2017 lower incidence of banded leaf and sheath blight was noticed in recommended dose of fertilizer (10.58 %) which was at par Site specific nutrient management (10.67 %), followed by Farmers practices (12.68 %). In 2018 lower incidence of banded leaf and sheath blight was recorded in Recommended dose of fertilizer (9.66 %) which was at par with Site specific nutrient management (9.83 %), followed by Farmers practices (11.52 %). Similarly on pooled basis lower incidence of banded leaf and sheath blight was noticed in Recommended dose of fertilizer (10.11 %) which was at par Site specific nutrient management (10.27 %), followed by Farmers practices (12.10 %). After 70 days of sowing in year 2017 lower incidence of banded leaf and sheath blight was noticed in Recommended dose of fertilizer (14.32 %) which was at par with Site specific nutrient management (14.47 %), followed by Farmers practices (17.10 %) while, in 2018 and on pooled basis treatments were found non-significant.

After 85 days of sowing in year 2017 lower incidence of banded leaf and sheath blight was noticed in Site specific nutrient management (17.90%) which was at par with recommended dose of fertilizer (17.91 %), followed by Farmers practices (21.53 %). In 2018 lower incidence of banded leaf and sheath blight was recorded in Recommended dose of fertilizer (16.61 %) which was at par with Site specific nutrient management (16.73 %), followed by Farmers practices (19.82 %). Similarly on pooled basis lower incidence of banded leaf and sheath blight was noticed in Recommended dose of fertilizer (17.26 %) which was at par with Site specific nutrient management (17.31 %), followed by Farmers practices (20.68 %) .

Table 1: Effect of tillage practices and nutrition management on Incidence of Banded leaf and sheath blight

Main Plot	Sub plot	40 DAS			55 DAS			70 DAS			85 DAS		
Tillage practices	**Nutrition management**	**2017**	**2018**	**Pooled**	**2017**	**2018**	**Pooled**	**2017**	**2018**	**Pooled**	**2017**	**2018**	**Pooled**
Permanent beds	Recommended dose of fertilizer	9.17	8.20	8.67	12.60	11.10	11.83	16.57	15.20	15.90	20.57	19.30	19.93
	Farmer's practice	11.00	9.93	10.47	14.70	13.00	13.83	19.60	18.03	18.83	24.50	22.97	23.73
	Site Specific nutrient management	9.23	8.43	8.83	12.73	11.43	12.10	16.73	15.67	16.23	20.83	19.87	20.33
Conventional tillage	Recommended dose of fertilizer	6.80	6.47	6.60	8.50	8.20	8.33	11.33	10.53	10.90	14.73	13.47	14.07
	Farmers practice	7.83	7.90	7.87	10.23	9.73	10.00	14.43	12.77	13.60	18.07	16.40	17.23
	Site Specific nutrient management	6.87	6.53	6.70	8.57	8.30	8.47	12.03	10.70	11.33	14.87	13.63	14.27
Zero tillage	Recommended dose of fertilizer	7.83	7.97	7.90	10.63	9.67	10.17	15.07	13.70	14.37	18.43	17.07	17.77
	Farmers practice	10.13	8.87	9.50	13.10	11.83	12.47	17.27	15.40	16.33	22.03	20.10	21.07
	Site Specific nutrient management	7.87	7.47	7.67	10.70	9.77	10.23	14.63	13.23	13.93	18.00	16.70	17.33
Tillage													
Permanent beds		9.80	8.86	9.32	13.34	11.84	12.59	17.63	16.30	16.99	21.97	20.71	21.33
Conventional tillage		7.17	6.97	7.06	9.10	8.74	8.93	12.60	11.33	11.94	15.89	14.50	15.19
Zero tillage		8.61	8.10	8.36	11.48	10.42	10.96	15.66	14.11	14.88	19.49	17.96	18.72
CD @ 5%		1.62	1.15	1.39	1.94	1.72	1.81	1.89	2.05	1.94	3.01	3.05	3.06
Nutrition													
Recommended dose of fertilizer		7.93	7.54	7.72	10.58	9.66	10.11	14.32	13.14	13.72	17.91	16.61	17.26
Farmer's practice		9.66	8.90	9.28	12.68	11.52	12.10	17.10	15.40	16.26	21.53	19.82	20.68
Site Specific nutrient management		7.99	7.48	7.73	10.67	9.83	10.27	14.47	13.20	13.83	17.90	16.73	17.31
CD @ 5%		1.17	1.18	1.09	1.75	1.54	1.56	2.42	NS	NS	2.77	2.85	2.80

2.2 Effect of nutrient management practices on severity of banded leaf and sheath blight.

Banded leaf and sheath blight severity after 40 days of sowing in year 2017 was lowest in Site specific nutrient management (13.83 %) which was at par Recommended dose of fertilizer (15.56 %), followed by Farmers practices (17.78 %). In 2018 lower severity of banded leaf and sheath blight was recorded in SSNM (16.79 %) followed by RDF (18.82 %) and FP (20.74 %). Similarly on pooled basis lower severity of banded leaf and sheath blight was recorded in SSNM (16.31 %) followed by RDF (17.04 %) and FP (19.26 %). (Table 2)

After 55 days of sowing in year 2017 lower severity of banded leaf and sheath blight was noticed in Site specific nutrient management (16.30 %) which was at par with recommended dose of fertilizer (18.03 %), followed by Farmers practices (20.49 %). In 2018 lower severity of banded leaf and sheath blight was recorded in SSNM (19.26 %) followed by RDF (20.99 %) and FP (23.46 %). On pooled basis lower severity of banded leaf and sheath blight was recorded in SSNM (17.78 %) which was at par with RDF (19.51%) followed by FP (21.98 %).

After 70 days of sowing in year 2017 lower severity of banded leaf and sheath blight was noticed in Site specific nutrient management (20.25 %) and Recommended dose of fertilizer (22.96 %) which was at par, followed by Farmers practices (26.17 %). Similar trends were observed in 2018 lower severity of banded leaf and sheath blight was noticed in Site specific nutrient management (22.47 %) and Recommended dose of fertilizer (25.18 %) which was at par, followed by Farmers practices (28.64 %). On pool basis also similar trends were observed lower severity of banded leaf and sheath blight was noticed in Site specific nutrient management (21.36 %) and Recommended dose of fertilizer (24.07 %) which was at par, followed by Farmers practices (27.41 %).

After 85 days of sowing in year 2017 lower severity of banded leaf and sheath blight was noticed in Site specific nutrient management (26.42 %) and Recommended dose of fertilizer (29.63 %) which was at par, followed by Farmers practices (33.83 %). Similar trends were observed in 2018 lower severity of banded leaf and sheath blight was noticed in Site specific nutrient management (29.63 %) and Recommended dose of fertilizer (33.33 %) which was at par, followed by Farmers practices (38.27 %). On pool basis also similar trends were observed lower severity of banded leaf and sheath blight was noticed in Site specific nutrient management (28.03 %) and Recommended dose of fertilizer (31.48 %) which was at par, followed by Farmers practices (36.05 %).

Table 2: Effect of tillage practices and nutrition management on severity (PDI) of Banded leaf and sheath blight

Main Plot	Sub plot	40 DAS			55 DAS			70 DAS			85 DAS		
Tillage practices	**Nutrition management**	**2017**	**2018**	**Pooled**	**2017**	**2018**	**Pooled**	**2017**	**2018**	**Pooled**	**2017**	**2018**	**Pooled**
Permanent beds	Recommended dose of fertilizer	15.56	18.52	17.04	17.78	20.74	19.26	22.96	25.18	24.07	28.89	32.59	30.74
	Farmer's practice	17.78	20.74	19.26	20.00	22.96	21.48	25.93	28.15	27.04	33.33	37.78	35.56
	Site Specific nutrient management	14.07	17.04	15.56	16.30	19.26	17.78	20.00	22.22	21.11	25.92	28.89	27.41
Conventional tillage	Recommended dose of fertilizer	13.33	16.30	14.81	15.56	18.52	17.04	20.74	22.96	21.85	26.67	29.63	28.15
	Farmers practice	15.56	18.52	17.04	17.78	20.74	19.26	23.70	25.93	24.82	30.37	34.08	32.22
	Site Specific nutrient management	11.85	14.81	13.33	14.07	17.04	15.56	18.52	20.74	19.63	23.70	26.66	25.18
Zero tillage	Recommended dose of fertilizer	17.78	20.74	19.26	20.74	23.70	22.22	25.18	27.41	26.30	33.33	37.78	35.56
	Farmers practice	20.00	22.96	21.48	23.70	26.67	25.19	28.89	31.85	30.37	37.78	42.96	40.37
	Site Specific nutrient management	15.56	18.52	17.04	18.52	21.48	20.00	22.22	24.44	23.33	29.63	33.33	31.48
Tillage													
Permanent beds		15.80	18.77	17.29	18.03	20.99	19.51	22.96	25.18	24.07	29.38	33.09	31.24
Conventional tillage		13.58	16.54	15.06	15.80	18.77	17.28	20.99	23.21	22.10	26.91	30.12	28.52
Zero tillage		17.78	20.74	19.26	20.99	23.95	22.47	25.43	27.90	26.67	33.58	38.02	35.80
CD @ 5%		0.57	1.15	0.46	1.00	1.99	1.32	0.91	1.40	1.15	0.91	1.15	0.99
Nutrition													
Recommended dose of fertilizer		15.56	18.52	17.04	18.03	20.99	19.51	22.96	25.18	24.07	29.63	33.33	31.48
Farmer's practice		17.78	20.74	19.26	20.49	23.46	21.98	26.17	28.64	27.41	33.83	38.27	36.05
Site Specific nutrient management		13.83	16.79	15.31	16.30	19.26	17.78	20.25	22.47	21.36	26.42	29.63	28.03
CD @ 5%		2.06	2.84	2.38	2.31	2.49	2.34	2.79	2.95	2.86	4.00	4.42	4.16

3. Effect of tillage and nutrient management practices on yield

The data on yield parameters of maize as influenced by different Tillage practice have been shown in Table 3 In year 2017 and on pooled basis no significant difference was found in grain yield as well as thousand grain weight whereas in the year 2018 significantly higher grain yield was recorded in permanent beds (5817 Kg/ha) followed by conventional tillage (5748 Kg/ha) which were found at par whereas minimum yield was recorded in zero tillage (5617 Kg/ha). In year 2018 significantly higher thousand grain weight was recorded in conventional tillage (306 g) was at par with permanent beds (305 g) which, followed by zero tillage (282 g). Nutrient management significantly influence grain yield which was highest in RDF (6006 Kg/ha) and found at par with SSNM (5905 Kg/ha) followed by FP (5271 Kg/ha). In year 2018 no significant difference was found in grain yield. On pooled basis significantly higher grain yield was recorded in RDF (5591 Kg/ha) which was found at par with SSNM (5420 Kg/ha), followed by FP (5036 Kg/ha). no significant difference was found on thousand grains weight among treatments in any year.

Comparison of various tillage practices reveal that conventional tillage practices gave maximum grain yield, followed by minimum tillage and zero tillage. These results are supported by findings of Khurshid *et al*. (2006) [6] and Khan *et al*. (2001) [4] that1000-grain weight of maize significantly increased in conventional till plots rather than no tilled plots. Nutrient management practices significantly influence the yield which was found higher in RDF, but at par with SSNM followed by FP in both the year. The higher grain yield of maize was mainly due to SSNM approach was ascribed due to higher but balanced nutrient application. This was evident through the findings of Jayaprakash *et al*. (2006)

[2], Kumar *et al*. (2007) [9] and Umesh (2008) [13] who reported higher grain yield of maize with application of SSNM and STCR. No significant difference was found on thousand grain weight due nutrition management. The result confirms the findings of Sharar *et al*. (2003) [14] who reported that the yield attributes increased with increased levels of fertilizer. While, Sivamurugan *et al*. (2017) [16] reported that RDF registered the highest 100 seed weight (38g) and it was comparable with STCR but superior to SSNM.

Table 3: Effect of tillage practices and nutrition management on yield

Main Plot	Sub plot	Grain yield (Kg/ha)			1000 Grain weight (g)		
Tillage practices	**Nutrition management**	**2017**	**2018**	**Pooled**	**2017**	**2018**	**Pooled**
Permanent beds	Recommended dose of fertilizer	6097	5361	5729	288	302	295
	Farmer's practice	5350	5049	5200	280	309	295
	Site Specific nutrient management	6004	5136	5570	286	305	296
Conventional tillage	Recommended dose of fertilizer	5992	5521	5756	282	309	295
	Farmers practice	5312	5029	5171	280	306	293
	Site Specific nutrient management	5939	5196	5568	290	303	297
Zero tillage	Recommended dose of fertilizer	5929	4649	5289	289	280	284
	Farmers practice	5149	4327	4739	283	282	283
	Site Specific nutrient management	5774	4471	5123	284	284	285
Tillage							
Permanent beds		5817	5182	5500	285	305	295
Conventional tillage		5748	5249	5498	284	306	295
Zero tillage		5617	4482	5050	285	282	284
SE(m)		144	107	118	3	4	3
CD @ 5%		NS	432	NS	NS	16	NS
Nutrition							
Recommended dose of fertilizer		6006	5177	5591	286	297	292
Farmer's practice		5271	4802	5036	281	299	290
Site Specific nutrient management		5905	4935	5420	287	297	292
SE(m)		144	229	111	4	5	3
CD @ 5%		448	NS	345	NS	NS	NS

Conclusion

Results of present study indicated that conventional tillage practice integrated with Site specific nutrient management were found good for minimizing the severity of BLSB but permanent raised beds and recommended dose of fertilizer provided highest yield which was at par conventional tillage and site specific nutrient management. Zero tillage and farmer's practice was found least effective with respect to BLSB severity and yield.

Acknowledgement

Support provided by Directorate of Research of GBPUAT, Pantnagar and AICRIP on Maize for conducting the field experiment is duly acknowledged.

References

1. Hooda KS, Bagaria PK, Khokhar M, Kaur H *et al*. Mass Screening Techniques for Resistance to Maize Diseases. ICAR-Indian Institute of Maize Research, PAU Campus, Ludhiana- 141004, 2018, 93.
2. Jayaprakash TC, Nagalikar VP, Pujari BT, Setty RA. Effect of organics and inorganics on growth and yield of maize under irrigation. Karnataka Journal Agriculture Science. 2006; 18(3):798.
3. Karami A, Homaee M, Afzalina SHS. Organic resource management impact of soil aggregate stability and soil physic-Chemi Properties. Agriculture Environment. 2012; 148:22-14.
4. Khan FUH, Tahir AR, Yule IJ. Intrinsic implication of different tillage practices on soil penetration resistance and crop growth. International Journal of Agricultural Biology. 2001; 1:6-23.
5. Khan HZ, Malik MA, Saleem MF. Effect of rate and source of organic material on the production potential of spring maize (*Zea mays* L.). Pakistan Journal of Agricultural Sciences. 2008; 45:40-43.
6. Khurshid KM, Iqbal, Arif MS, Nawaz A. Effect of tillage and mulch on soil physical properties and growth of maize. International Journal of Agricultural Biology, 2006; 8:593-596.
7. Kumar R, Singh IS. Genetic control of banded leaf and sheath blight (Rhizoctonia solani f. sp. sasakii) in maize (Zea mays L.). Cereal Res Comm. 2004; 32:309-316.
8. Kumar A, Kumar S. A Review on Impact of Tillage and Nutrient Management on Maize Production in Indian Scenario. International Journal of Current Microbiology and Applied Sciences. 2018; 7:583-594.
9. Kumar A, Gali SK, Hebsur S. Effect of different levels of NPK on growth and yield parameters of sweet corn. Karnataka Journal of Agricultural Sciences. 2007; 20(1):41-43.
10. Kumar P, Kumar M, Kumar R, Kishor K, Yadav S, Raj RK. Effect of nutrient management on growth of maize (*Zea mays* L.) under different tillage practices. International Journal of Chemical Studies. 2018; 6(3):107-110.
11. Majumdar K, Satyanarayana T, Pampolino M, Dutta S, Jat ML, Sulewski G *et al*. Nutrient Expert ® for Hybrid Maize (version 1.1). A decision support tool for providing field specific fertilizer recommendations for tropical hybrid maize. International Plant Nutrition Institute and International Maize and Wheat Improvement Center, India, 2013, 52.
12. Pradhan S. Insect Pests of Crops. National Book Trust, New Delhi, India, 1969, 80.
13. Shankar MA, Umesh MR. Site specific nutrient management (SSNM): An approach and methodology for achieving sustainable crop productivity in dryland

Alfisols of Karnataka. In: Tec. Bult. Univ. Agric. Sci., Bangalore, 2008.
14. Sharar MS, Ayub M, Nadeem MA, Ahmad N. Effect of different rates of nitrogen and phosphorus on growth and grain yield of maize. Asian Journal of Plant Science. 2003; 2(3):347-349
15. Sheoran OP, Tonk DS, Kaushik LS, Hasija RC, Pannu RS. Statistical Software Package for Agricultural Research Workers. Recent Advances in information theory, Statistics & Computer Applications by D.S. Hooda & R.C. Hasija Department of Mathematics Statistics, CCS HAU, Hisar, India, 1998, 139-143.
16. Sivamurugan AP, Ravikesavan R, Yuvaraja A. Effect of Planting Density and Nutrient Management Practices on the Performance of Maize Hybrids in Kharif Season. Chemical Science Review and Letters, ISSN 2278-6783, 2017.
17. Tang HT, Rong TZ, Yang JP. Research advance on sheath blight (Zea mays L.) in maize. J Maize Sci. 2004; 12:93-96.
18. Tolessa D, Preez CC, Ceronio GM. Effect of tillage system and nitrogen fertilization on efficacy of applied nitrogen by maize in Western Ethiopia. South African Journal of Plant and Soil. 2009; 26(1):36-44.
19. Umesh MR. Investigation on balanced fertilization for maize– pigeonpea cropping sequence in Alfisols of Karnataka. Ph.D.Thesis. Univ. Agric. Sci., Bangalore, 2008.
20. Wheeler BEJ. An introduction to plant disease, John Wiley and fungi. Phytopathology. 1969; 22:837-845.