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Survey on post harvest losses in potato under southern dry zone of Karnataka

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Abstract
An estimation studies on post harvest losses in potato was surveyed at different potato growing areas of Hassan district during *Kharif* season for three consecutive years from 2015 to 2017. At main field of potato both losses due to left over produce from randomly selected three farmers plots and losses from storage heap during marketing of potato of same plots were documented on yield parameters such as total tuber yield, late blight diseased tubers, cut or cracked tubers and bruised tubers. The pooled data of three years indicated that, an average losses due to left over produce in different farmer field was about 13.83 per cent of late blight diseased tubers, 15.69 per cent of cut or cracked tubers and 4.60 per cent of bruised tubers. Further, an average losses at storage heap was around 1.83 per cent of diseased tubers, 0.98 per cent of cut or cracked tubers and 0.48 per cent of bruised tubers in short period of storage of 15 to 20 days at farm. From the studies, it was found that both losses due to left over produce in different plots of farmers and losses from storage heap contributed nearly 35.00 per cent post harvest losses in potato under Southern Dry Zone of Karnataka during *Kharif* season.

Keywords: Survey, post harvest losses, storage heap and Hassan district

Introduction
Potato (*Solanum tuberosum* L.) popularly known as 'The king of vegetables' is the staple food for most of the population of India after cereals. Being a major vegetable, it has huge importance to the processing industry as well. Due to its perishable nature, certain quantity of produce is lost at different levels of marketing as well as on the farm. These post harvest losses are the sum of all the losses occurs during different operations like harvesting, packaging, transport, loading-unloading, storage, selling and pathological losses, etc.

Potato grown over an area of 1.97 lakh hectares with the production of 344 lakh tones and average national yield per hectare is 21.10 tonnes in India. It is cultivated in an area of 41,000 hectares with the production of 3,61,000 tonns in Karnataka (Anon, 2015) [1]. Hassan district was selected purposively based on maximum area of potato cultivation in Karnataka under plain region.

The term "storage" as now applied to fresh produce is the holding of produce under controlled conditions. An usually in the study area of Hassan district, producers store the produce directly on to the soil, especially wet soil, use dirty harvesting or field containers contaminated with soil, crop residues or decaying produce and dirty containers. There was paramount potato post-harvest loss occurred due to improper and lack of storing facilities, insects and worms as well poor handling techniques.

The reduction of post-harvest loss of vegetables is a complementary means for increasing production. It may not be necessary to considerably step up the production of vegetables with the growing demand, if the post-harvest loss is reduced to a greater extent. From the stand point of economy and food safety for the population of the country, there is a need to reduce such losses. Therefore the present study is a comprehensive attempt to estimate the post harvest losses of potato in Hassan district under Southern dry zone of Karnataka.

Materials and Methods
A study was conducted in Hassan district located in 13^0 10' 36' N and 76^0 14' 88' E latitude and longitude, which receives an average rainfall of about 828 mm. An estimation studies on

post harvest losses in potato was surveyed at different major potato growing areas of Hassan district during *Kharif* season for three consecutive years from 2015 to 2017. At main field of potato both losses due to left over produce from randomly selected three farmers plots and losses from storage heap during marketing of potato of same plots were documented on yield parameters such as total tuber yield, late blight diseased tubers, cut or cracked tubers and bruised tubers.

1) Estimation of post harvest losses in potato during 2015, 2016 and 2017
Location: Hassan District
Identification of farmers plot

Sl. No.	Particulars	
1	Location (Latitude & Longitude)	13^0 10' 36' N and 76^0 14' 88' E
2	State	Karnataka
3	District	Hassan
4	Tehsil/Taluk	Hassan

Sl. No.	Particulars	2015	2016	2017
5	Block/Mandal	Kuduregundi	Somanahalli	Somanahalli
6	Village	Muttathi	Somanahalli	Somanahalli
7	Name of the farmer	Mr. Satish	Mr. Manjegowda	Mr. Chandre Gowda
8	Total land holding (ha)	2.0 ha	1.5 ha	2.0 ha
9	Area under potato	0.5 ha	0.5 ha	0.5 ha
10	Date of visit	11.09.2015	11.08.2016	18.09.2017

2) Details of potato crop grown by farmer

Sl. No.	Particulars	2015	2016	2017
1	Variety	Kufri Jyoti	Kufri Jyoti	Kufri Jyoti
2	Purpose (seed/ware crop)	Ware crop	Ware crop	Ware crop
3	Area under each variety	0.5 ha	0.5 ha	0.5 ha
4	Date of planting	09.06.2015	02.06.2016	05.06.2017
5	Date of harvesting/ heap	11.09.2015	11.08.2016	18.09.2017
6	Method of harvesting	Bullock drawn implement	Bullock drawn implement	Bullock drawn implement

Results and Discussion

An estimation of post harvest losses due to left over produce and heap in farmers plot was reported that late blight diseased tubers (21.18 & 1.67%), cut or cracked tubers (28.23 & 1.08%) and bruised tubers (7.28 & 0.00%) during 2015, respectively (Table. 1 & 2). Similarly during 2016, an average losses of about 15.02 and 2.19 per cent of late blight diseased tubers, 16.45 & 1.37 per cent of cut or cracked tubers and 5.82 & 0.97 per cent of bruised tubers registered in left over produce and heap, respectively (Table. 3 & 4). Whereas, in 2017 average losses from left over produce and in heap revealed that 5.30 & 1.63 per cent late blight diseased tubers, 2.40 & 0.48 per cent cut or cracked tubers and 0.71 & 0.46 per cent bruised tubers, respectively (Table.5 & 6).

The pooled data of three years indicated that, an average losses due to left over produce in different farmer field was 13.83 per cent of late blight diseased tubers, 15.69 per cent of cut or cracked tubers and 4.60 per cent of bruised tubers. Further, an average losses during storage heap was around 1.83 per cent of diseased tubers, 0.98 per cent of cut or cracked tubers and 0.48 per cent of bruised tubers in short period of storage of 15 to 20 days at farm (Table 7 & 8).

The post harvest losses at farmer's field level occur due to harvesting injuries; for example, for the first round potato is harvested by bullock drawn plough. These potato harvesting mechanisms trigger potato loss at farm gate level. In addition to this, after harvested usually potatoes stored at farmer's field for 2–4 days due to lack of marketing demand in the area without any shade and since the area is recognized by its heavy rainfall, the harvested potatoes were easily spoiled. Certainly huge amount of potatoes thrown away or discarded at the farmer's field, all these are neither consumed nor marketed in any form. The study was confirmed with similar results of Ashish Raghuvanshi *et al*. (2018) [2], Gajanana *et al*. (2006) [3], Kumar *et al*. (2004) [4], Sharma and Swati, 2010 [6]. Martey *et al*. (2012) [5] found that about 75 per cent of the total postharvest losses occurred at the farm level and about 25 per cent at the market level.

Table 1: Post harvest losses due to left over of produce from randomly selected plots during 2015

Sl. No	Particulars	Total tuber yield per plot (kg)	Late blight diseased tubers (kg)	Late blight diseased tubers (%)	Cut/crack tubers (kg)	Cut/ crack tubers (%)	Bruised tubers (kg)	Bruised tubers (%)
1	Plot-1	6.14	1.16	18.89	2.12	34.53	0.50	8.14
2	Plot-2	8.35	2.15	25.75	2.80	33.53	0.85	10.18
3	Plot-3	7.10	1.30	18.31	1.18	16.62	0.25	3.52
4	Average weight of tubers (kg)	7.19	1.54	21.18	2.03	28.23	0.53	7.28
5	Average weight of good and poor quality potato tubers	3.09	4.10					

Table 2: Post harvest losses at heap after storage during 2015

Sl. No.	Particulars	Total sample of tubers (kg)	Late blight diseased tubers (kg)	Late blight diseased tubers (%)	Cut/ crack tubers (kg)	Cut / crack tubers (%)	Bruised tubers (kg)	Bruised tubers (%)
1	Sample-1	200.00	3.80	1.90	1.60	0.80	0.00	0.00
2	Sample-2	195.00	3.40	1.74	2.74	1.41	0.00	0.00
3	Sample-3	180.00	2.45	1.36	1.85	1.03	0.00	0.00
4	Average weight of tubers (kg)	191.66	3.22	1.67	2.06	1.08	0.00	0.00
5	Average weight of good and poor quality potato tubers	186.38	5.28					

Table 3: Post harvest losses due to left over of produce from randomly selected plots during 2016

Sl. No	Particulars	Total tuber yield per plot (kg)	Late blight diseased tubers (kg)	Late blight diseased tubers (%)	Cut/crack tubers (kg)	Cut/ crack tubers (%)	Bruised tubers (kg)	Bruised tubers (%)
1	Plot-1	4.50	0.75	16.67	0.95	21.11	0.32	7.11
2	Plot-2	6.75	0.90	13.33	1.10	16.30	0.45	6.67
3	Plot-3	5.45	0.82	15.05	0.65	11.93	0.20	3.67
4	Average weight of tubers (kg)	5.56	0.82	15.02	0.90	16.45	0.32	5.82
5	Average weight of good and poor quality potato tubers	3.52	2.04					

Table 4: Post harvest losses at after storage heap during 2016

Sl. No.	Particulars	Total sample of tubers (kg)	Late blight diseased tubers (kg)	Late blight diseased tubers (%)	Cut/ crack tubers (kg)	Cut / crack tubers (%)	Bruised tubers (kg)	Bruised tubers (%)
1	Sample-1	300.00	6.75	2.25	3.95	1.32	3.15	1.05
2	Sample-2	295.00	5.85	1.98	3.75	1.27	2.75	0.93
3	Sample-3	320.00	7.50	2.34	4.85	1.52	3.00	0.94
4	Average weight of tubers (kg)	305.00	3.22	2.19	4.18	1.37	2.97	0.97
5	Average weight of good and poor quality potato tubers	294.63	10.37					

Table 5: Post harvest losses due to left over of produce from randomly selected plots during 2017

Sl. No	Particulars	Total tuber yield per plot (kg)	Late blight diseased tubers (kg)	Late blight diseased tubers (%)	Cut/crack tubers (kg)	Cut/crack tubers (%)	Bruised tubers (kg)	Bruised tubers (%)
1	Plot-1	31.50	1.75	5.55	0.85	2.70	0.20	0.63
2	Plot-2	29.25	1.50	5.13	0.55	1.88	0.18	0.62
3	Plot-3	34.50	1.80	5.22	0.90	2.61	0.30	0.87
4	Average weight of tubers (kg)	31.75	1.68	5.30	0.77	2.40	0.23	0.71
5	Average weight of good and poor quality potato tubers	29.07	2.68					

Table 6: Post harvest losses at heap after storage during 2017

Sl. No.	Particulars	Total sample of tubers (kg)	Late blight diseased tubers (kg)	Late blight diseased tubers (%)	Cut/ crack tubers (kg)	Cut/crack tubers (%)	Bruised tubers (kg)	Bruised tubers (%)
1	Sample-1	500.00	8.50	1.70	2.25	0.45	2.00	0.40
2	Sample-2	695.00	10.25	1.47	3.15	0.45	3.10	0.45
3	Sample-3	520.00	9.00	1.73	2.85	0.55	2.80	0.54
4	Average weight of tubers (kg)	571.66	9.25	1.63	2.75	0.48	2.63	0.46
5	Average weight of good and poor quality potato tubers	557.03	14.63					

Table 7: Post harvest losses due to left over of produce from randomly selected plots during 2015 to 17

SL. No	Particulars	Mean sample weight of tubers (kg)	Late blight diseased tubers (%)			Mean	Cut/ crack tubers (%)			Mean	Bruised tubers (%)			Mean
			2015	2016	2017		2015	2016	2017		2015	2016	2017	
1	Plot- 1	14.05	18.89	16.67	5.55	13.70	34.53	21.11	2.70	19.45	8.14	7.11	0.63	5.29
2	Plot- 2	14.78	25.75	13.33	5.13	14.74	33.53	16.30	1.88	17.24	10.18	6.67	0.62	5.82
3	Plot-3	15.68	18.31	15.05	5.22	12.86	16.62	11.93	2.61	10.39	3.52	3.67	0.87	2.69
4	Average weight of tubers (kg)	14.83	21.18	15.02	5.30	13.83	28.23	16.45	2.40	15.69	7.28	5.82	0.71	4.60

Table 8: Losses at heap after storage during 2015 to 17

SL. No.	Particulars	Mean sample weight of tubers (kg)	Late blight diseased tubers (%)			Mean	Cut/ crack tubers (%)			Mean	Bruised tubers (%)			Mean
			2015	2016	2017		2015	2016	2017		2015	2016	2017	
1	Sample-1	333.33	1.90	2.25	1.70	1.95	0.80	1.32	0.45	0.86	0.00	1.05	0.40	0.48
2	Sample-2	395.00	1.74	1.98	1.47	1.73	1.41	1.27	0.45	1.04	0.00	0.93	0.45	0.46

3	Sample-3	340.00	1.36	2.34	1.73	1.81	1.03	1.52	0.55	1.03	0.00	0.94	0.54	0.49
4	Average weight (kg)	356.11	1.67	2.19	1.63	1.83	1.08	1.37	0.48	0.98	0.00	0.97	0.46	0.48

Plate 1: Post harvest losses in farmers field

Conclusion

From the survey, it was recorded a significant losses both due to left over produce after harvest and even after temporary traditional storage at farmers field. Hence, it is necessary to adopt cost effective storage technique using PVC pipes in the heap with thatched roof for reducing the post harvest loss and to get good premium price in the market during off-season.

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