

Original Research Paper

Studies on feasibility of sustainable quality seed potato production technology and development of supply chain for the benefit of small and marginal potato growers of Karnataka

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ABSTRACT

Management of aphid vectors in potato is important for the production of quality seed potato. Aphids are the major vectors of many potato viruses which transmit viral diseases limiting the seed potato production. To explore the area with aphid free/low population a weekly aphid observation was made in major potato growing areas of Chikkaballapur and Chickmagalur districts during *rabi* and *kharif* seasons to assess the build-up trends on the standing crop using aphid-leaf count and catches of yellow water pan and yellow sticky traps. Aphid population was below threshold level in the areas surveyed, however in Chickmagalur aphid build-up was erratic due to heavy rain fall followed by dry spells. Harvested potato in Chikkaballapur was treated and stored in cold storage for three months. During June, 50 per cent of the seed stock was transported to Chickmagalur area for planting in *kharif* season and remaining seed was used for planting in Chikkaballapur area during *rabi* season. In Chickmagalur, the harvested and treated seed was stored in low cost country potato store for three months and 50 per cent seed from warehouse was transported to Chikkaballapur for *rabi* planting and remaining seed was planted in Chickmagalur area during November thereby saving nearly 40 per cent of seed cost. Thus, the feasibility supply chain has been established making the local potato growers self-sustainable in quality seed potato production resulting in 30-40 percent seed requirement met locally produced quality seed and non-traditional areas will be brought under potato cultivation. The breeder seed was multiplied under low cost insect proof net houses during *rabi* season in Chikkaballapur area, harvested seed was stored in cold storage thereafter distributed among the local potato growers for planting during *kharif* season in Chickmagalur area.

Key words: Management, aphids, sticky traps, water pan, abiotic.

INTRODUCTION

The Plateau area only accounts for 7% of the area and 4% of the production (Minhas *et al*, 2011). Karnataka is one of the important potato growing states in peninsular India. It is mainly cultivated in Kolar, Belgaum, Hassan, Chikkaballapur, Chickmagalur, Bangalore Rural and Dharwad districts. It is grown as rain-fed *kharif* crop in Belgaum, Chickmagalur, Dharwad and Hassan districts and as *rabi* crop in Chikkaballapur, Kolar and Bangalore Rural districts under protective irrigation. Unavailability of irrigation water for the *rabi* crop and repeated fall in *kharif* potato production due to heat and late blight stresses, however, limit the development of potato cultivation in

this state (Rana *et al*, 2014). Potato is important cash crop in Karnataka produces 6,98,300 MT cultivated in an area of 44,400 ha with productivity of 15.72 tons per ha (Anonymous, 2013) and has a ready market within the state and neighbouring states.

The major limiting factor for low productivity in this area is non-availability of quality seed at affordable cost, presence of insect pests and diseases during the cropping season. Aphid vectors are transmitting the pathogenic viruses from infested to healthy crop limiting the disease-free seed potato production which further leads to fast degeneration (Ali *et al*, 2013; Sharma *et al*, 2016).

Due to lack of trust of their on-farm grown potato can be utilised for seed purpose, Karnataka growers are dependent on the fresh seed material transported from distant North Indian plains undergoes serious quality deterioration when transported to Southern states, thus increasing the seed input cost (Rana *et al*, 2015). Augmentation of local seed potato production and supply is consequently the best way of increase in demand and reducing seed cost in the southern states. Hence, the study was undertaken for technical feasibility and economic viability of quality seed potato production and development of supply chain locally in the statemaking potato growers self-sustainable in seed potato production.

MATERIAL AND METHODS

Aphid monitoring studies have revealed that vector incidence and resulting virus pressure are much lower at higher elevations (Vucetic *et al*, 2013; Ali *et al*, 2015). To explore the area with aphid free/low population six plots of one hectare each were selected for weekly aphid count in Chikkaballapur and Chickmagalur districts during *rabi* and *kharif* seasons following 100 aphid-leaf count at random from top, middle and bottom of 33 plants and one bottom leaf from the 34th plant making 100 leaves throughout the cropping period (Simpson, 1940). Beside aphid count on potato leaves, yellow sticky traps (YST) were mounted on posts 1.5 m from the ground coated with castor oil to capture alate aphids. Yellow water pan traps (YPT) filled with water mixed with light detergent powder were also installed in the selected plots at the crop level. The trapped a late aphids were removed weekly from the traps, counted, preserved in 70 per cent alcohol for identification up to species level.

Low cost semi-permanent double door insect proof net house was constructed during 2014 at Potato Research Station (PRS), Chikkaballapur in half an acre

plot using PVC poles and 40 mesh nylon net. Three more low cost semi-permanent insect proof net houses measuring quarter an acre using granite poles and 40 mesh nylon net in farmers' fields were constructed during 2015 in Sadali, Chikkapylagurki and Chakuponahalli village of Chikkaballapur districts for multiplying breeder/quality seed potato under protected condition during *rabi* season. An innovative low-cost potato storage structures measuring 8 x 8 x 10 and 10 x 10 x 10 ft using areca nut logs with thatched roofing and racks are made with low cost areca nut wood planks. The structure has storage capacity of 2.5 and 4.0 tons, respectively were built in Kerkepete village and KVK, Mudigere in Chickmagalur district as a model during 2014 and 2016. The potato crop harvested during *kharif* 2014 was sorted/graded and treated with 3 per cent boric acid for 30 minutes to avoid bacterial wilt contamination and tubers were stored after shade drying covered with the chopped dried *Lantana camara* leaves to avoid the infestation of storage pests like potato tuber moth (Ali *et al*, 2017).

RESULTS AND DISCUSSION

Aphid monitoring:

Aphid incidence during *rabi* (average of three years) in Chikkaballapur area

All the six locations monitored, aphid population was observed below the threshold level *i.e.* 20 aphids/100 compound leaves up to January but from the last week of January to first week of February aphid population was increased in all the locations due to increase in day temperature (**Fig. 7**). *Aphis gossypii* was found predominant in this location compared to *Myzus persicae* in the standing crop throughout the cropping period (**Figure 1 to 6**). *A. fabae* and *A. spiraeicola* were also observed in the crop as well as in the aphid traps.

Fig 1.

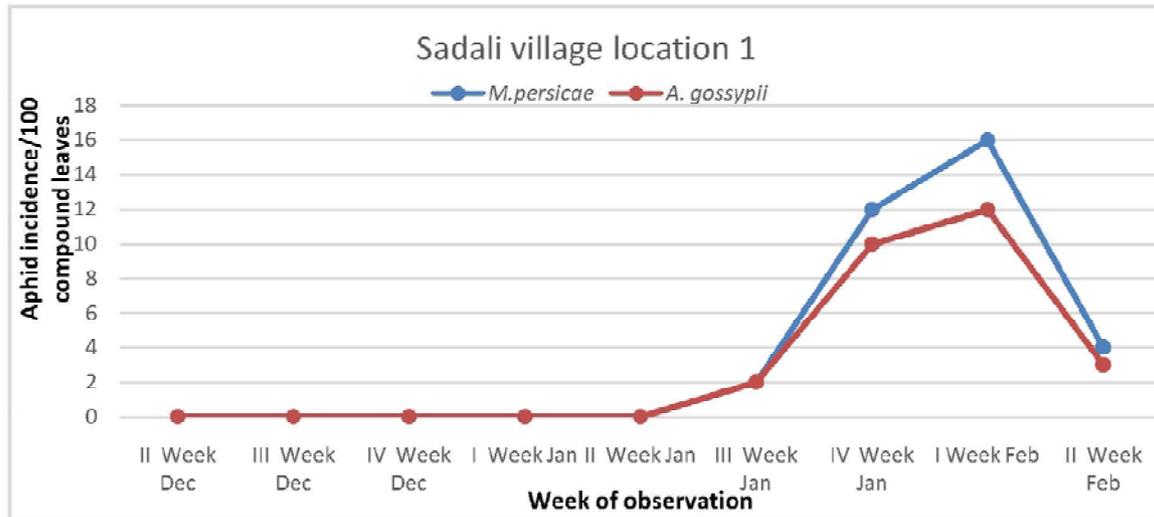


Fig 2.

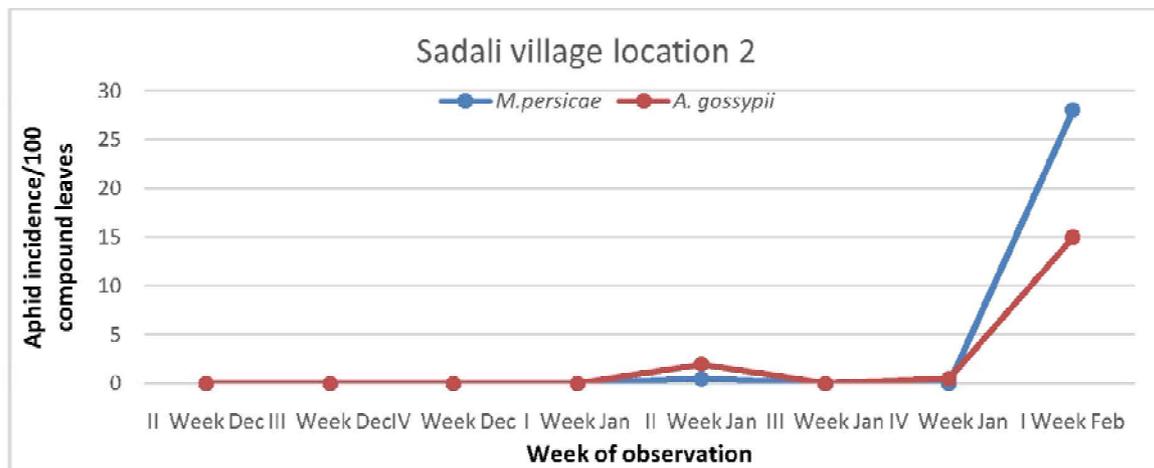


Fig 3.

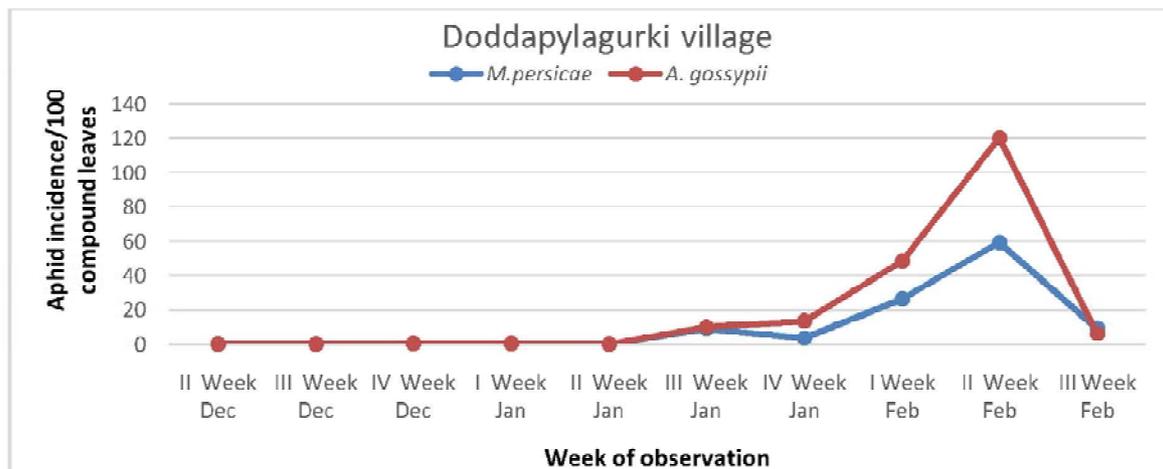


Fig 4.

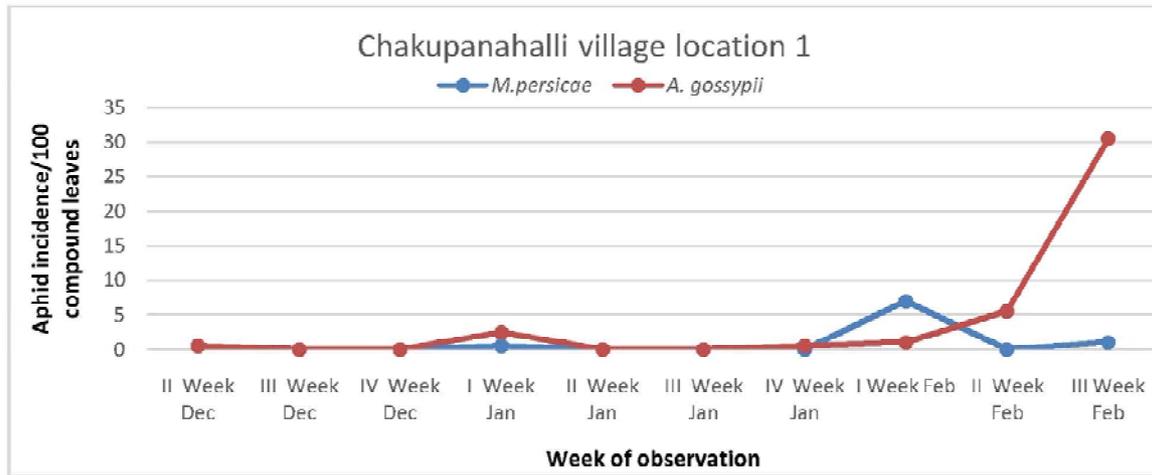


Fig 5.

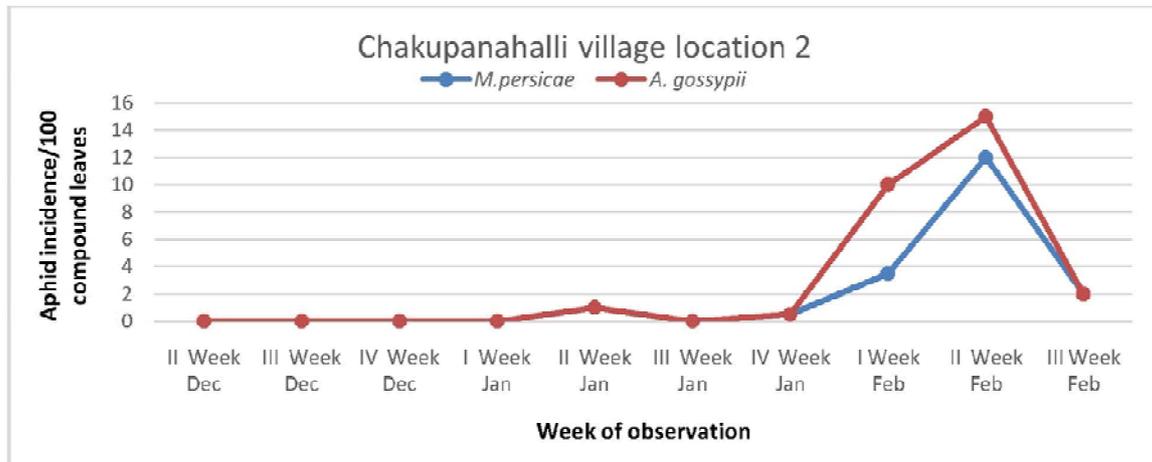


Fig 6.

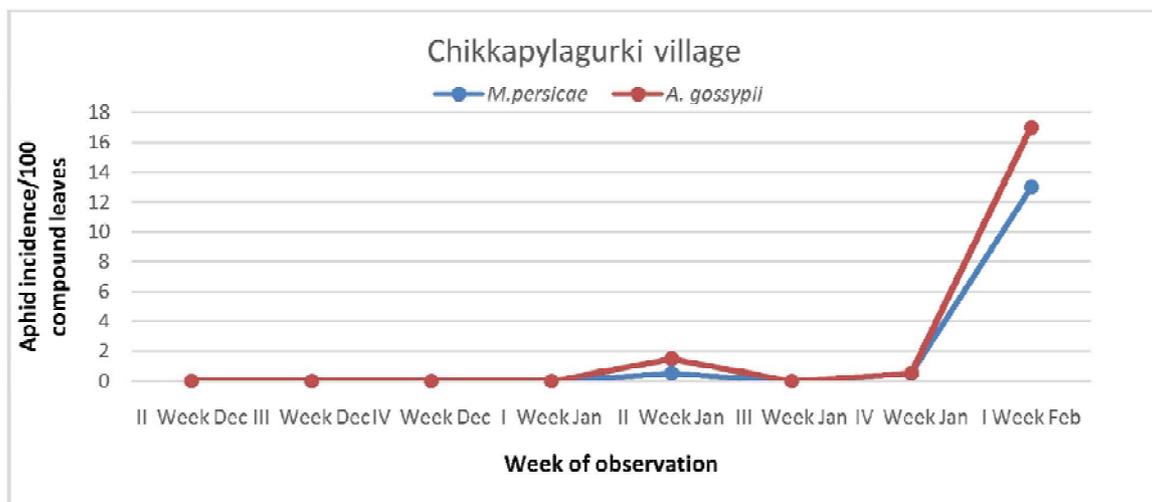
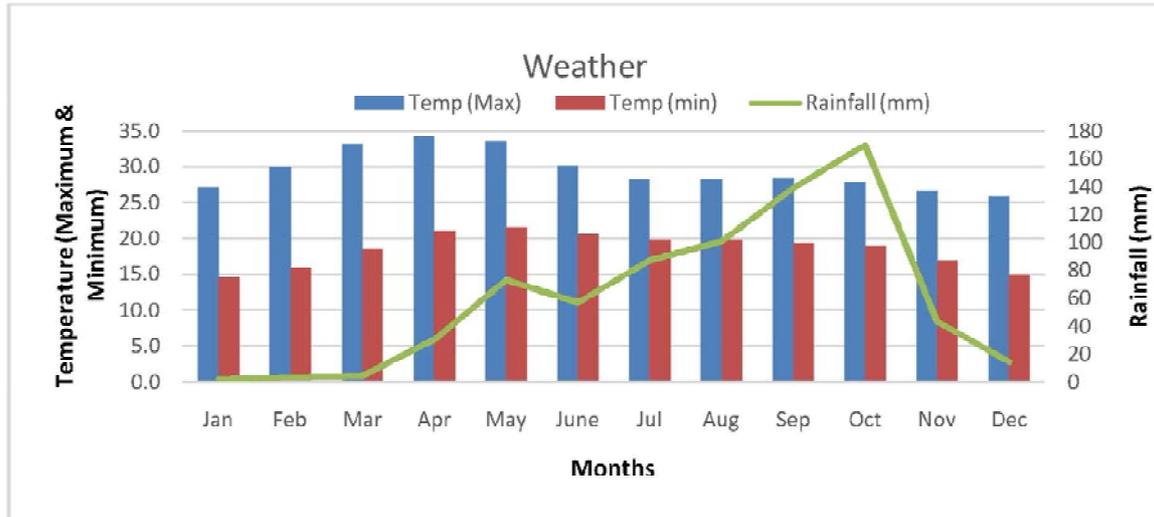


Fig 7.



Aphid incidence during *kharif* season (average of two years) in Tarikere Taluk of Chickmagalur District

The aphid build-up pattern was varied due to heavy rain followed by dry spells in this area during *kharif* season. Due to intermittent rainfall aphids are not able to colonize in the crop for a longer period. (Figure 8

to 13). *M.persicae* and *A. gossypii* are predominant species in this area. However, *A. fabae*, *A. craccivora*, *Brevicoryn brassicae*, *Microsiphum* spp. and *A. spiraecola* are also observed in the crop as well as in the aphid traps.



Installation for aphid traps into potato field Counting of aphids in the water pan trap

Fig 8.

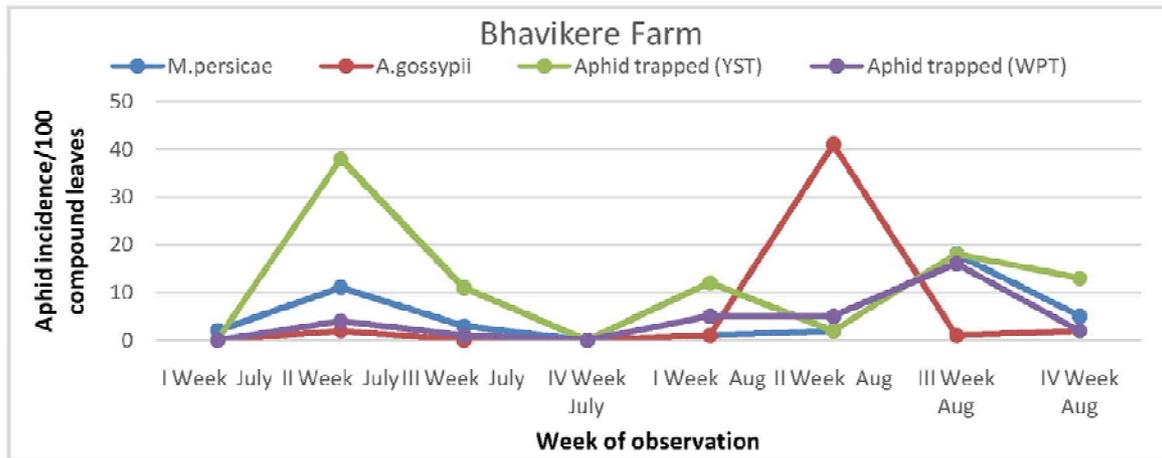


Fig 9.

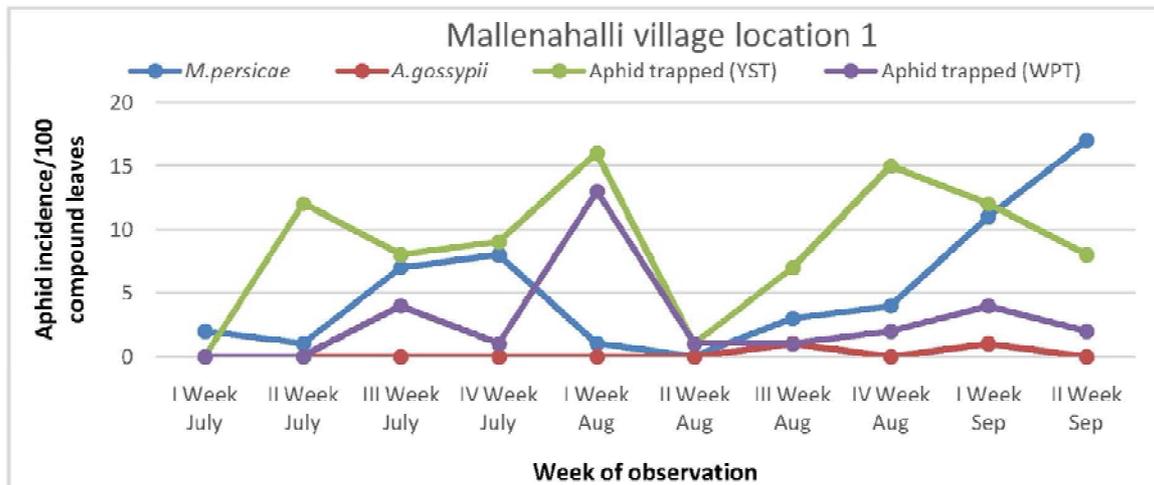


Fig 10.

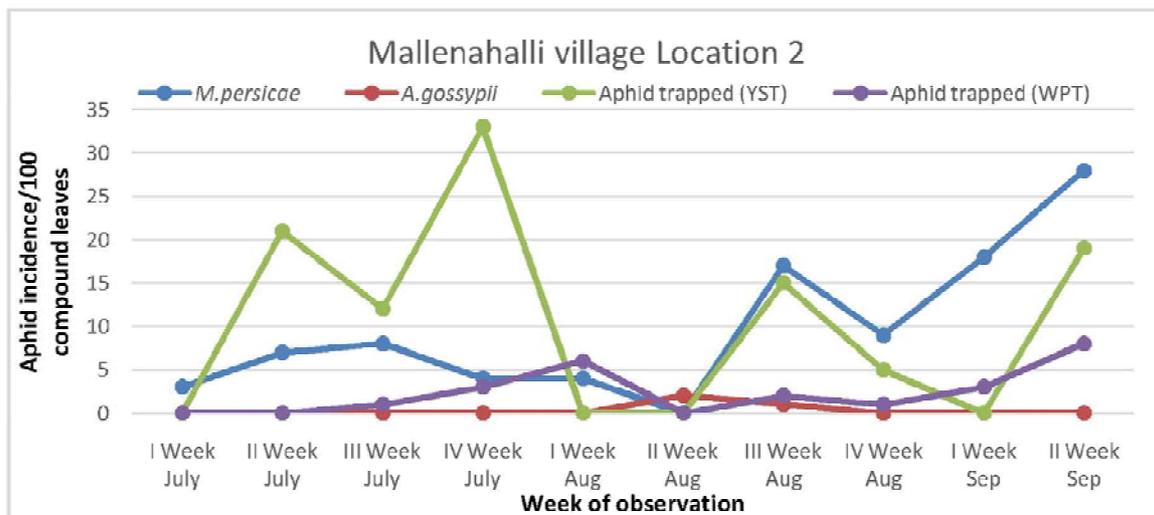


Fig 11.

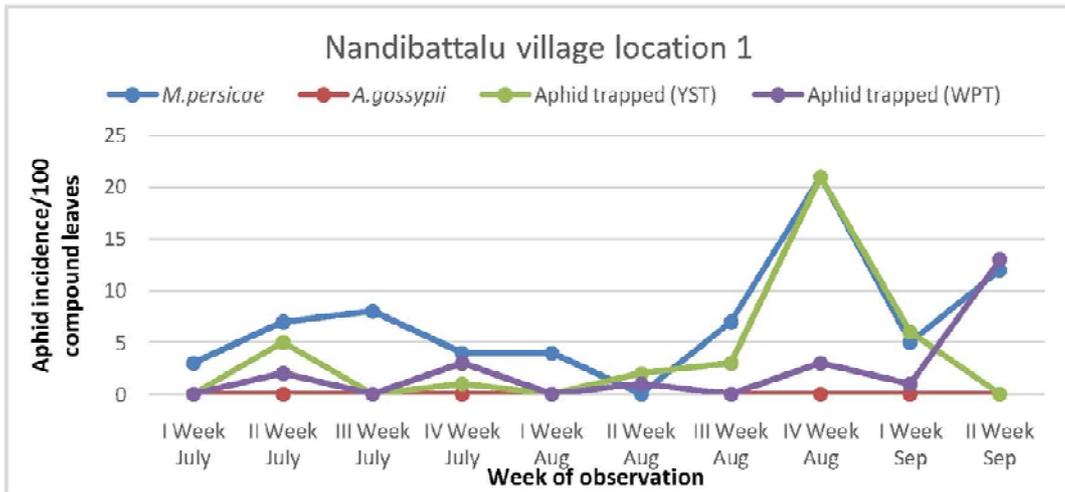


Fig 12.

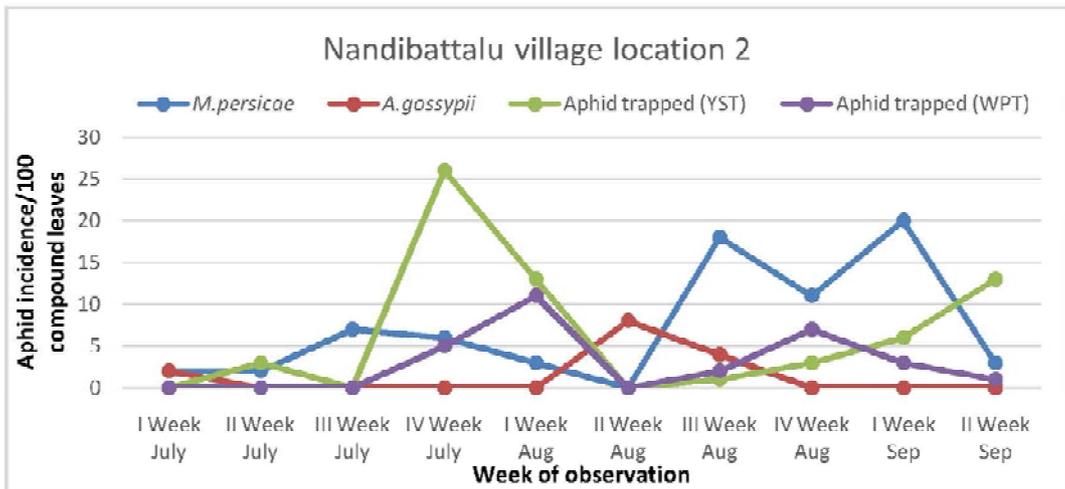
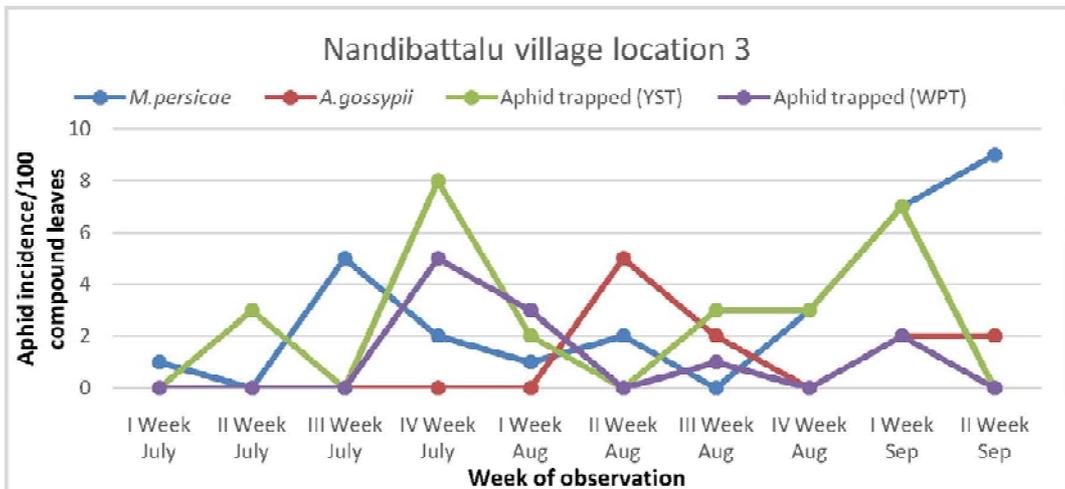


Fig 13.



Low cost wooden Country Potato Warehouse in Karnataka

The harvested *rabi* crop in Chikkaballapur area was transported and stored in innovative warehouses in Chickmagalur for dormancy break (Ali *et al*, 2017) and the stored seed was utilised for planting in Chickmagalur area during *kharif* season. Harvested *kharif* potato in Chickmagalur was also stored in the warehouse for three months used in Chickmagalur and Chikkaballapur area during subsequent *rabi* season. By using this low-cost storage warehouse facility, small and marginal potato growers of Karnataka are able to retain good quality seed potato thereby saving nearly 40 per cent of potato seed cost.

Development of seed potato supply chain for the benefit of small and marginal potato growers during *kharif* and *rabi* seasons in Karnataka

The quality seed potato was planted in the month of November under the net house at PRS during two

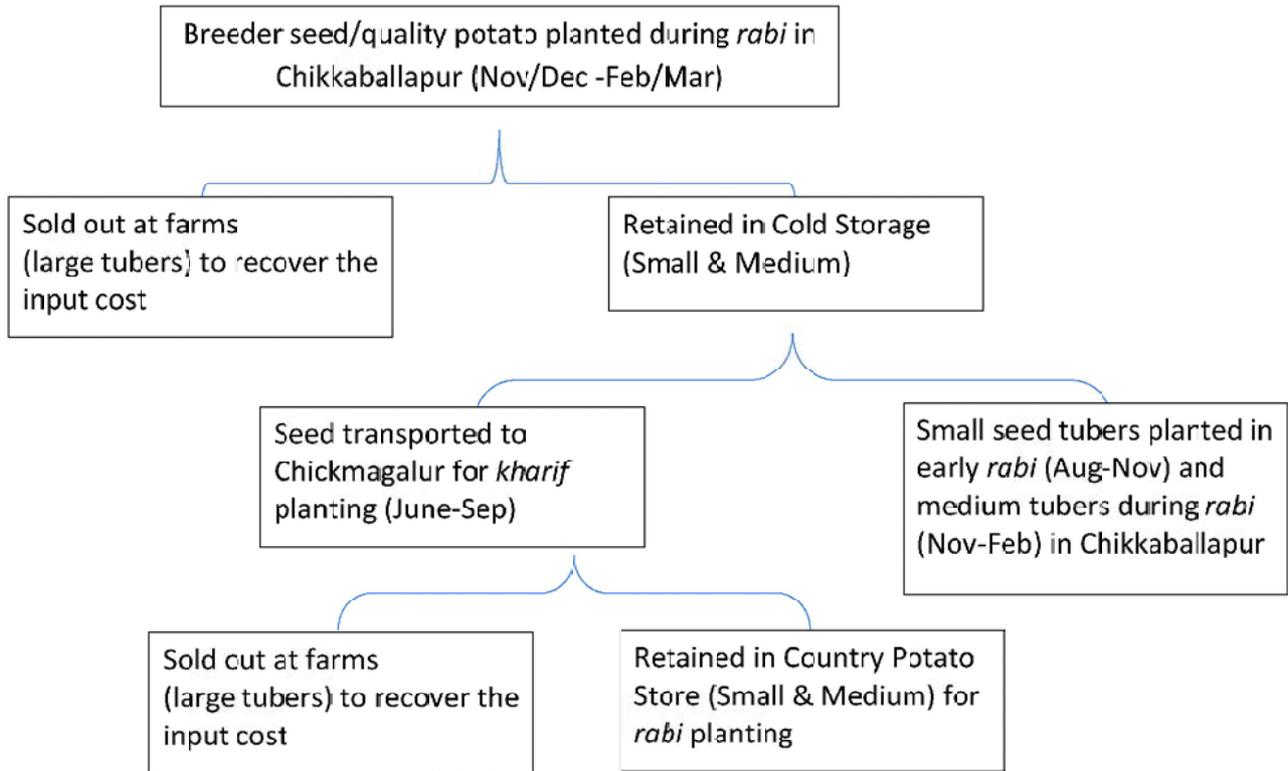
rabi seasons (2014-15 & 2015-16) which were harvested during February, 2015 & 16. Harvest was sorted/graded and treated by 3 per cent Boric acid for 20 minutes and shade dried. The seed was stored in the cold storage for three months. During June, 2015 and 2016, half of the stored seed stock was transported to Chickmagalur area for planting during *kharif* season and remaining seed was also used for planting in Chikkaballapur area during *rabi* season.

Likewise, the quality seed multiplied under protected insect proof nethouse condition at farmers' fields were harvested during the month of March, 2016 and graded/treated seed was stored in the cold storage for three months. During June, 2016 large and medium stored seed tubers were transported and planted in Chickmagalur area for *kharif* 2016 and remaining small tubers were retained in the cold storage up to August, 2016 for using the same seed stock during early *rabi* and *rabi* 2016 in Chikkaballapur area thereby saving nearly 40 per cent of seed cost (Annexure 1).



Low-cost insect proof net houses built by International Potato Center (CIP) in Chikkaballapur area

Annexure 1. Seed potato production and development of seed potato supply chain for the benefit of small and marginal potato growers during *kharif* and *rabi* seasons in Karnataka



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