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## Cultivation of cluster bean (*Cyamopsis tetragonoloba* L.) in association with *Ber* (*Zizyphus mauritiana*)—An eco-friendly vege-forage-horti system of agro-forestry

■R.A. SINGH, DHARMENDRA YADAV<sup>1</sup> AND JITENDRA SINGH<sup>1</sup>

**Associated Authors:**

<sup>1</sup>Directorate of Extension, C.S.A.  
University of Agriculture and  
Technology, KANPUR (U.P.) INDIA

**Author for correspondence :**

**R.A. SINGH**  
Directorate of Extension, C.S.A.  
University of Agriculture and  
Technology, KANPUR (U.P.) INDIA  
Email : rasingh\_csau@ yahoo.co.in

**Abstract :** The adaptive trial was laid out for two consecutive years during 2004-05 and 2005-06 in the area jurisdiction of Zonal Agricultural Research Station, Mainpur. The site is situated in catchments area of river Kali having degraded soils. The three year well thrived newly orchards of *Ber* were selected for vege-forage - horti system in *Ber* growing tract of Mainpur. The four varieties of cluster bean *i.e.*, Pusa Mausami, Pusa Sadabahar, Pusa Navbahar and local were grown in the interspaces of cultivar Banarasi Karka of *Ber*. The cultivar Pusa Navbahar of cluster bean gave highest green pod yield by 107.00 q/ha followed by cv. PUSA Sadabahar (103.70 q/ha). Pusa Mausami gave green pod by 101.50 q/ha in association of *Ber*. The lowest yield was recorded with local variety, used as check. The order of varieties performance in association of *Ber* was Pusa Navbahar (107.00 q/ha) > Pusa Sadabahar (103.70 q/ha) > Pusa Mausami (101.50 q/ha) and local check (92.00 q/ha). The average fruits yield of *Ber* was found higher (80.05 q/ha) under companion cropping system over sole cropping of *Ber* (78.00 q/ha) under rainfed situation.

**Key words :** Vege-forage-horti system, Rainfed-situation, Tolerant to drought, Synergistic effect, Crisp in fruits, Scarlet colour

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Agro-horticulture system is one form of agro-forestry in arable lands having fruit trees as tree component. Thus, the system provides higher income per unit area. Some times, well maintained and established orchards bring even better returns than the field crops. The amount of rainfall and its distribution decides largely the type of fruit that can be grown. In dry lands area of South-Western-Semi-Arid Zone of U.P. guava, ber, phalsa and pomegranate can be raised.

Dry land pulses crop base agro-horticulture systems have been found dependable propositions for utilization of degraded lands in erratic rainfall areas because fruit trees in general, can tolerate extreme soil and climatic conditions, whereas legumes provide good land cover. The fruit tree component should be selected suiting the soil and climatic conditions. The tree should have the following features *viz.*, fast growing high palatability, good cropping ability, ability to withstand browsing and resistance to drought. Likewise, some dry land pulse crops like moong

bean, urd bean and cluster bean should fulfill the ability to grow well even under shade, tolerant to drought, easy propagation, high palatability, ability to conserve soil and water and able to withstand.

In agro-horticultural alley cropping system with *Ber* for fruit plantation along with rainy season dry land crop cluster bean proved to be better companion crop under rainfed situation. It is very hardy type of crop and survives well in semi tropic area. It is grown very commonly in the northern plains and appreciable area has come under this crop in southern plain also. The pod is primarily used as a vegetable. In the low rainfall areas of northern plains, it is the most common poor man's vegetable crops. Thus a strong need was felt to develop a suitable model of agro-forestry for harvesting of vegetable, fodder and fruit under two tier systems in degraded situation, is the subject matter of this paper.

## RESEARCH METHODS

The adaptive trial was carried out for two consecutive years during 2004-05 and 2005-06 in the area jurisdiction of Zonal Agricultural Research Station, Mainpuri. The pilot area is situated in the catchments area of river Kali. The soil of experimental site was sandy loam having pH 8.5, organic carbon 0.28, available phosphorus 9.8 kg/ha and available potash 273 kg/ha, therefore, the fertility status of the pilot area soil was low. The twenty years mean annual rainfall of pilot area is 800 mm. The length of growing period of representative area varies between 120-150 days. The three year well developed younger orchards of *Ber* were selected for vege-forage-horti system, which were in flowering and fruiting stage. The *Ber* plants in orchards were planted in rows at the distance of 8 meter. The distance between plant to plant in rows was also maintained 8 meter. The distance between *Ber* and cluster bean rows was maintained 50 cm from both the sides *Ber* rows for easy inter cultural operations. The cluster bean was sown in first fortnight of July at the row spacing of 25 cm during both years. The 28 rows of cluster bean were sown between two rows of *Ber*. The distance between rows of cluster bean was reduced for adjusting 100 per cent plant stand. Four varieties of cluster bean *i.e.*, Pusa Masami, Pusa Sadabahar, Pusa Navbahar and local were tested as filler crop with *Ber* on five farmers fields. Cultivar Banarasi Karaka of *Ber* was already planted in the orchards of the farmers. The recommended dose of 20 kg N + 60 kg P<sub>2</sub>O<sub>5</sub> + 60 kg K<sub>2</sub>O/ha were given to cluster bean. N.P.K. @ 60, 30 60 gms per plant in the fourth year and 80, 40, 80 g per plant in fifth year plantation of *Ber* trees in conjunction with 20 kg of well rotten FYM was given to each plant. The other recommended package of practices were followed in *Ber* fruit trees and filler crop of cluster bean. The green pods of cluster bean for vegetable purpose was harvested when they attained the marketable stage. Only tender and non-fibrous pods were hand picked for market purpose. After picking of pods for vegetable, the green foliage was used for green fodder. The *Ber* fruit was picked when crisp with light yellowish scarlet colour on the outer skin during month of February

to April.

## RESEARCH FINDINGS AND DISCUSSION

The yield data recorded from adaptive trial under different companion cropping systems are discussed below.

### Green pod and haulm yield of cluster bean:

Cultivar Pusa Navbahar of cluster bean grown in association of *Ber* gave highest green pod yield by 107.00 q/ha followed by cv. PUSA Sadabahar (103.70 q/ha). Pusa Mausami yielded green pod by 101.50 q/ha grown in conjunction of *Ber*. Local cultivar used as check variety gave yield by 92.00 q/ha in the filler cropping system of cluster bean and *Ber*. Therefore, the order of varieties performance was Pusa Navbahar (107.00 q/ha) > Pusa Sadabahar (103.70 q/ha) > Pusa Mausami (101.50 q/ha) and local (92.00 q/ha) in vege-forage-horti system of *Ber* + cluster bean. The cultivars yielded higher pod yield gave lowest haulm yield, while higher haulm harvested with low yielder varieties of cluster bean. Cultivar Pusa Navbahar gave lowest haulm yield of 169.50q/ha, while local cultivar yielded maximum haulm (174.00 q/ha) for green fodder. This was due to genetic variability of genotypes (Table 1).

Srinivasan *et al.* (2002) also reported that under rainfed cultivation cv. Pusa Navbahar of cluster bean gave highest green pod yield compared to other test genotypes.

### Fruit yield of *Ber*:

The fruits yield of *Ber* was found higher under companion cropping system of *Ber* + cluster bean over the sole crop of *Ber*. The average fruits yield of *Ber* was recorded by 80.05 q/ha under *Ber* + cluster bean cropping system, which was higher by a margin of 2.05 q/ha or 2.60 per cent over the alone cropping system of *Ber* (78.00 q/ha). This was due to the synergistic effect of companion crop of cluster bean on *Ber* (Table 1). Singh *et al.* (2011) found the similar results in companion cropping of *Ber* + cluster bean.

**Table 1 : Yield of *Ber* and cluster bean under vege-forage-horti system of agro-forestry**

Filler cropping system	Green pod yield of cluster bean (q/ha)	Green haulm yield of cluster bean (q/ha)	Fruit yield of <i>Ber</i> (q/ha)
<i>Ber</i> alone	-	-	78.00
<i>Ber</i> + Pusa Mausami	101.50	171.00	80.00
<i>Ber</i> + Pusa Sadabahar	103.70	170.80	80.70
<i>Ber</i> + Pusa Navbahar	107.00	169.50	81.00
<i>Ber</i> + local	92.00	174.00	78.50

**Conclusion:**

Under vege-forage-horti system of agro-forestry, cv. PUSA NAVBAHAR of cluster bean gave highest green pod yield of 107.00 q/ha for vegetable and *Ber* produced 81.00 q/ha fruits under rainfed condition.

**Srinivasan, R.,** Srinivasan, K.R., Subbaiah, A., Srinivasan, K. and Veeraragavthatham, D. (2002). Technology for cultivation of cluster bean under rainfed conditions. Abstract (In), Intl. Conf. Veg. Bangalore, 11-14 November: 180-181 pp.

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