

## COMPETITIVE PERFORMANCE OF VEGETABLES GROWN UNDER SAPLING OF TELSUR TREE (*Hopea odorata*)

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### ABSTRACT

An experiment was carried out at Char sadipur near Pabna town during August to February, 2014 to evaluate the growing performance of three winter vegetables grown under Telsur (*Hopea odorata*) saplings. The vegetables were Palangshakh (*Bengal spinach*), Kalmishakh (*Swamp cabbage*) and Indian spinach (*Basella alba*). Each vegetable were laid out using the Randomized Complete Block Design (RCBD) with three replications as separate experiment. In each experiment vegetables are grown at different distance from tree base which were treated as different treatment. Performance of winter vegetables in terms of morphological parameters as well as fresh and dry yield was affected significantly by distance from the tree. The result showed that vegetable production was the highest recorded in control treatment which was significantly similar with 2, 3 and 4 feet distance from the tree base and the lowest was observed less than 1 feet distance. Among the different morphological characteristics of winter vegetable, standard leaf length, standard leaf diameter, stem girth, fresh weight and dry weight decreased consistently with the decrease of distance from sapling where the best result was obtained under 4 feet distance from Telsur sapling. The highest vegetable production was recorded under 4 feet distance from Telsur sapling which was statistically similar with control and the lowest vegetable production was observed under 1 feet distance from Telsur sapling.

**Key words:** Performance, telsur, vegetables

### Introduction

The actual forest area of Bangladesh is approximately 17.50% (BBS, 2004). But in order to enjoy the benefits of nature, at least 25 percent of our land area must be covered with forest. Again, human nutrition is very essential to develop a nation in every way. Vegetables can play a crucial role in this. In general, vegetables are rich sources of minerals, vitamins and essential amino acids. A few techniques have recently been advocated to overcome the future food challenges and confirming the environmental benefits, Agroforestry in one of them. Agroforestry, the integration of tree and crop / vegetable on the same piece of land, is a promising production system for maximizing yield and maintaining a friendly environment (Nair, 1990). Telsur is a forest plant species from the Dipterocarpaceae family. It is found in Bangladesh, Cambodia, India, Laos, Malaysia, Myanmar, Thailand and Vietnam. It is a large tree that grows up to 45 m high and the base of the trunk reaches a diameter of 4.5 m. It grows in forests, preferably near rivers, at altitudes between 0 and 600 m. Valued for its wood, it is an endangered species in its natural habitat (IUCN, 2006). Vegetable cultivation under Telsur provides both the demand for wood and for human food. To increase overall production, the current study was therefore conducted with the aim of evaluating the performance of important vegetables grown under Telsur tree, to identify the appropriate Agroforestry system for maximum land use in Bangladesh.

### Materials and Methods

The study was made to evaluate the performance of vegetables in association with sapling of telsur timber species. The soil of the experimental area was a medium high land. The texture of the soil was silty loam having pH 6.7 (Amir and Bhuiya, 1994). The topography of the field was medium high land above flood

level. In this study Indian spices (*Basella alba*), Palangshakh (*Bengal spinach*) and Kalmishakh (*Swamp cabbage*) were cultivated under 6 month's aged saplings of Telsur (*Hopea odorata*). Randomized Complete Block Design (RCBD) with three replications as separate was practiced in this experiment. Individual plot size was 9 ft x 2 ft. In each experiment vegetables are grown at different distance from tree base which were treated as treatment viz., T<sub>0</sub> = Open field referred to as control, T<sub>1</sub> = 1 feet distance from the tree, T<sub>2</sub> = 2 feet distance from the tree, T<sub>3</sub> = 3 feet distance from the tree T<sub>4</sub> = 4 feet distance from the tree. Over all lay out of the all experiments are shown in Fig. 1. For evaluating the effect of all vegetables on *Hopea odorata*, vegetables were treated as treatment and control condition was vegetables without tree. The experimental land was first opened on 15 October, 2014 and the operation was done by spade.

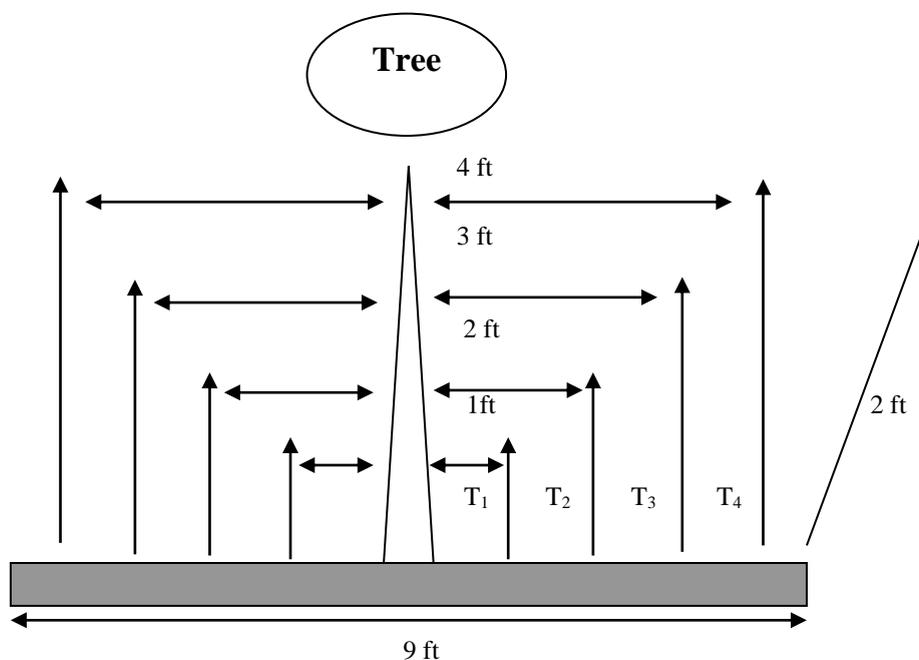


Fig. 1: Layout of the Experiment

**Crop establishment and management:** Palangshakh (*Bengal spinach*) and kalmishakh (*Swamp cabbage*) seeds were directly sown following broadcasting method in the experimental plot on 20th November 2014. The seeds were sown. After emergence finally all vegetables were thinned out maintaining 10 and 15 cm distance from plant to plant. Indian spices (*Basella alba*) seedling were transplanted on 20th November 2014. Seedlings planted in all plots were watered immediately after transplanting. No chemical fertilizers except cow dung were applied into the experimental field during the final land preparation. To keep the plots free from weeds, weeding was done three times for experimental plots and control plots. The plots were irrigated by using water cane to supply sufficient soil moisture for the vegetable. Thinning out, Pest and disease management and other intercultural operation were done as required.

**Data collection and analysis:** Plant samples were collected randomly from all the respective plots. Ten plants were selected from each pot for data collection. The following plant characters of were recorded as plant height (cm), stem girth (cm), no. of leaves plant<sup>-1</sup>, leaf length, Fresh weight plant<sup>-1</sup> (g), Dry weight plant<sup>-1</sup> (g) etc. Fresh weight of sample plants was taken. For determining dry weight of plants, sub-samples were oven dried at 80°C for 48 hours until constant weight was reached. Dry weight was calculated using the formula. Total dry weight= Sub-sample oven dry weight/ Sub-sample fresh weight × Total fresh weight. Data regarding various parameters under study for the experiment were statistically analyzed by the computer using statistical package programme MSTAC-C. Mean comparisons were done by DMRT (Duncan's Multiple Range Test) at 5% level of significance.

## Results and Discussion

### Morphological characters of indian spinach (*Basella alba*) grown with different spacing in association with telsius (*Hopea odorata*)

**Plant height (cm):** The plant height of Indian spinach was affected significantly. The best plant height (48.91 cm) was recorded in without seedling treatment (Table 1). Similarly the plant height was recorded under both 4 & 3 feet distance from seedling (Table 1) was 48.75 cm and 47.16 cm, respectively. The lowest plant height (43.84 cm) was observed under 1 feet distance from seedling. Similar type results were observed by Dhukia *et al.* (1988) who found that closer plant from tree base has severely affected by root competition.

**Stem girth (cm):** Stem girth of Indian spinach was also significantly influenced with increasing distance from tree base (Table 1). Like plant height similar trend variation was observed in case of stem girth where the highest stem girth recorded under control condition (3.46 cm) and lowest at 1 feet distance (3.031 cm) from tree base.

Table 1: Morphological characters of indian spinach (*Basella alba*) grown with different spacing in association with telsius (*Hopea odorata*) tree sapling

Treatment	Plant height (cm)	Stem girth (cm)	No. of leaves of plant	Leaf length (cm)
T <sub>0</sub>	48.91a	3.46a	28.00a	18.81a
T <sub>1</sub>	43.84d	3.031d	20.00c	14.67d
T <sub>2</sub>	45.55c	3.181c	22.00b	16.17c
T <sub>3</sub>	47.16b	3.291b	24.00b	17.49b
T <sub>4</sub>	48.75a	3.40a	27.00a	18.79a
Level of sign.	**	**	**	**
LSD	1.56	0.107	2.43	1.20

**No. of leaves plant<sup>-1</sup>:** No. of leaves plant<sup>-1</sup> is the most important yield contributing character, which was also significantly influenced by different distance from telsius plant. No. of leaves plant<sup>-1</sup> was significantly influenced by different distance orientation from the base (Table 1) significantly. The highest no. of leaves (28.00) was recorded in control and the second two highest no. of leaves plant<sup>-1</sup> (27.00 and 24.00) was observed in 4 and 3 feet which was statistically similar to that of control.

**Leaf length (cm):** Leaf length per plant differed significantly among the treatments (Table 1). The best plant leaf length (18.81 cm) was recorded in without seedling treatment. Similarly the plant leaf length was recorded under both 4 & 3 feet distance from seedling was 18.79 cm and 17.49 cm, respectively. The lowest plant leaf length (14.67 cm) was observed in 1 feet distance from seedling.

**Dry weight (g plant<sup>-1</sup>):** Dry weight of Indian spinach was affected significantly by the distance from tree and root growth. The best plant dry weight (7.38 g) was recorded in without seedling treatment (Fig. 2) and the lowest plant dry weight (5.89 g) was observed under 1 feet distance from seedling. It was noticeable that plant dry weight of Indian spinach was significantly increased with the increase of distance of seedling. Similar type results were observed by Dhukia *et al.* (1988).

**Yield (tha<sup>-1</sup>):** The yield of Indian spinach was affected significantly at 5% level of significance due to light, nutrient and water competition. Indian spinach yield plant<sup>-1</sup> was also significantly influenced by growth of root length of different distance levels from tree base (Fig. 2). The highest yield (83.36 tha<sup>-1</sup>) was recorded in the open field. Significantly the highest yield (83.0 tha<sup>-1</sup>) was found in 4 feet from tree base which was statistically similar to that of the open field condition. The lowest yield (73.36 tha<sup>-1</sup>) was recorded in 1feet distance from tree base.

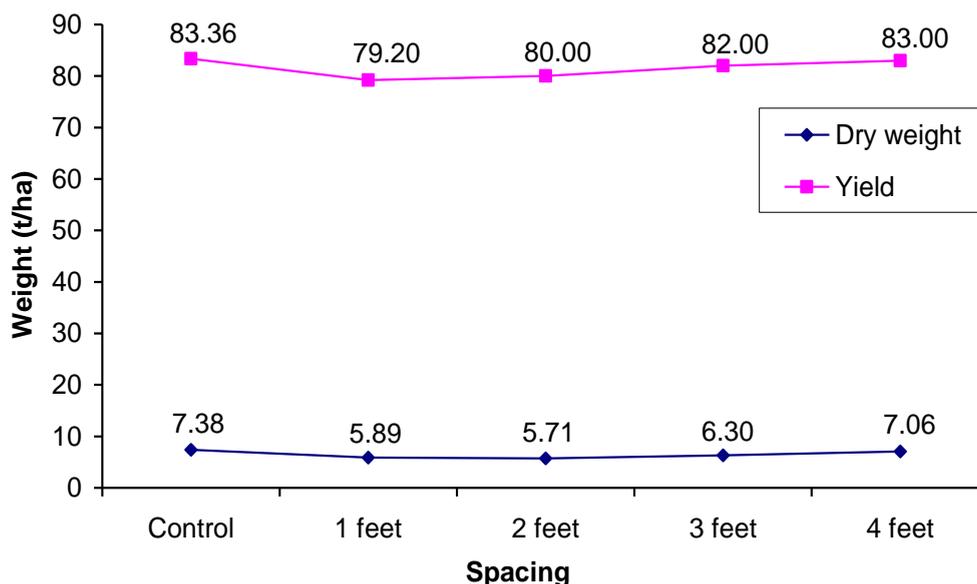


Fig 2: Dry weight and yield of indian spices in association with *Hopea odorata*

**Morphological characters of palangshakh (*Bengal spinach*) grown with different spacing in association with telsur (*Hopea odorata*)**

**Plant height (cm):** The plant height of palangshakh significantly by the distance from telsur. The best plant height (69.63 cm) was recorded in without seedling treatment. Similarly the plant height was recorded under both 4 & 3 feet distance from seedling was 69.59 cm and 67.68 cm. The third highest plant height (65.68 cm) was produced under 2 feet distance from seedling and the lowest plant height (63.47 cm) was observed under 1 feet distance from seedling.

**Stem girth (cm):** Stem girth of palangshakh was also significantly influenced with increasing distance from tree base (Table 2). Like plant height similar tend variation was observed in case of stem girth where highest stem girth recorded under control condition (3.89 cm) and lowest at 1 feet distance (3.48 cm) from tree base. Stem girth of palangshakh at 3-4 feet distance from tree base were statistically similar with control condition. Near the trees base i.e. closest to the trees there was a competition for moisture and nutrients between the roots of palangshakh and telsur saplings.

**No. of leaves plant<sup>-1</sup>:** No. of leaves plant<sup>-1</sup> is the most important yield contributing character, which was also significantly influenced by the distance from telsur. The highest no. of leaves (18.51 cm) was recorded in control and the second two highest no. of leaves plant<sup>-1</sup> (17.69 cm, and 16.38 cm) was observed in 4 and 3 feet which was statistically similar to that of control. The lowest no. of leaves plant<sup>-1</sup> (12.30 cm) was observed less than 1 feet distance from seedling base (Table 2).

**Leaf length:** Leaf length per plant differed significantly among the treatments. The best plant leaf length (17.71 cm) was recorded in without seedling treatment (Table 2). Similarly the plant leaf length was recorded under both 4 & 3 feet distance from seedling was 17.69 cm and 16.38 cm. The third highest plant leaf length (14.92 cm) was produced under 2 feet distance from seedling and the lowest plant leaf length (12.92 cm) was observed under 1 feet distance from seedling. It was noticeable that plant leaf length of palangshakh was significantly increased with the increase of distance of seedling.

Table 2: Morphological characters of palangshakh (*Bengal spinach*) grown with different spacing in association with telsius (*Hopea odorata*)

Treatment	Plant height (cm)	Stem girth (cm)	No. of leaves of plant	Leaf length (cm)
T <sub>0</sub>	69.63a	3.89a	18.51a	17.71a
T <sub>1</sub>	63.47d	3.48d	12.30d	12.92d
T <sub>2</sub>	65.68c	3.637c	14.49c	14.92c
T <sub>3</sub>	67.68b	3.76b	16.50b	16.38b
T <sub>4</sub>	69.59a	3.87a	18.49a	17.69a
Level of sign.	**	**	**	**
LSD	1.89	0.109	1.98	1.25

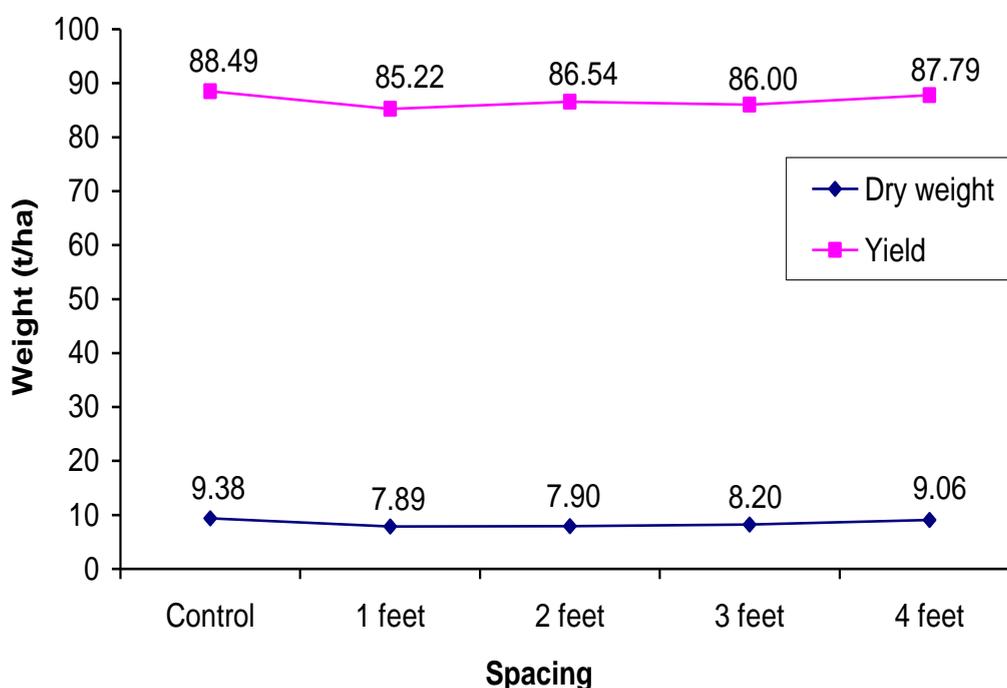


Fig 3: Dry weight and yield of palangshakh in association with *Hopea odorata*

**Dry weight (g plant<sup>-1</sup>):** Dry weight of palangshakh was affected significantly by the distance from tree and root growth. The best plant dry weight (9.38 g) was recorded in without seedlings treatment (Fig. 3). The second highest plant dry weight (9.06 g) was produced under 3 feet distance from seedling and the lowest plant dry weight (7.89 g) was observed under 1 feet distance from seedling. It was noticeable that plant dry weight of palangshakh was significantly increased with the increase of distance of seedling.

**Yield (tha<sup>-1</sup>):** Yield per plant differed significantly among the treatments. The best yield (88.49 tha<sup>-1</sup>) was recorded in without seedling treatment (Fig. 3). Similarly the yield per plant was recorded under both 3 and 4 feet distance from seedling. The third highest yield (86.54 tha<sup>-1</sup>) was produced under 2 feet distance from seedling and the lowest plant dry weight (85.22 tha<sup>-1</sup>) was observed under 1 feet distance from seedling. It was noticeable that yield of palangshakh was significantly increased with the increase of distance of seedling. Similar type results were observed by Dhukia *et al.* (1984).

**Morphological characters of kalmishakh (*Swamp cabbage*) grown with different spacing in association with telsur (*Hopea odorata*)**

**Plant height (cm):** Due to the effect of seedling ages the plant height of kalmishakh was affected significantly (Table 3). The best plant height (48.91 cm) was recorded in without seedling treatment. Similarly the plant height was recorded under both 4 and 3 feet distance from seedling was 48.75 cm and 47.16 cm (Table 3). The third highest plant height (45.55 cm) was produced under 2 feet distance from seedling and the lowest plant height (43.84 cm) was observed under 1 feet distance from seedling. It was noticeable that plant height of kalmishakh was significantly increased with the increase of distance of seedling.

**Stem girth (cm):** Stem girth of Kalmishakh was also significantly influenced with increasing distance from tree base (Table 3). Like plant height similar trend variation was observed in case of stem girth where highest stem girth recorded under control condition (3.46 cm) then (3.40 cm) which was 4 feet distance from tree base and lowest at 1 feet distance was (3.031 cm) from tree base.

Table 3: Morphological characters of kalmishakh (*Swamp cabbage*) grown with different spacing in association with telsur (*Hopea odorata*)

Treatment	Plant height (cm)	Stem girth (cm)	No. of leaves of plant	Leaf length (cm)
T <sub>0</sub>	48.91a	3.46a	28.00a	18.18a
T <sub>1</sub>	43.84d	3.031d	20.00c	14.67d
T <sub>2</sub>	45.55c	2.121c	22.00b	16.17c
T <sub>3</sub>	47.16b	3.291b	24.00b	17.49b
T <sub>4</sub>	48.75a	3.40a	27.00a	18.79a
Level of sign.	**	**	**	**
LSD	1.56	0.107	2.43	1.20

**No. of leaves plant<sup>-1</sup>:** Due to the effect of seedling ages the no. of leaves plant<sup>-1</sup> of kalmishakh was affected significantly (Table 3). The best plant no. of leaves (28.00) was recorded in without seedling treatment. Similarly the no. of leaves plant<sup>-1</sup> was recorded under both 4 and 3 feet distance from seedling was 27.00 cm and 24.00 cm. The lowest no. of leaves plant<sup>-1</sup> (20.00) was observed under 1 feet distance from seedling. It was noticeable that no. of leaves plant<sup>-1</sup> of coriander was significantly increased with the increase of distance of seedling.

**Leaf length:** Leaf length per plant differed significantly among the treatments. The best plant leaf length (18.81 cm) was recorded in without seedling treatment. Similarly the plant leaf length was recorded under both 4 and 3 feet distance from seedling which was 18.79 cm and 17.49 cm (Table 3). The lowest plant leaf length (14.67 cm) was observed under 1 feet distance from seedling. Similar type results were observed by Dhukia *et al.* (1988).

**Dry weight (g plant<sup>-1</sup>):** Dry weight per plant differed significantly among the treatments (Fig 4). The best plant fresh weight (8.02 g) was recorded in without seedling treatment. Similarly the plant fresh weight was recorded under both 4 and 3 feet distance from seedling was 7.94 g and 7.56 g (Fig 4). The lowest plant fresh weight (7.00 g) was observed under 1 feet distance from seedling. It was noticeable that plant fresh weight of coriander was significantly increased with the increase of distance of seedling.

**Yield (tha<sup>-1</sup>):** The yield of kalmishakh was affected significantly at 5% level of significance due to light, nutrient and water competition. The highest yield (84.29 tha<sup>-1</sup>) was recorded in the open field. Significantly the highest yield (84.21 tha<sup>-1</sup>) was found in 4 feet from tree base which was statistically similar to that of control condition and the lowest yield was 76.69 tha<sup>-1</sup> in 1 feet distance from the tree base.

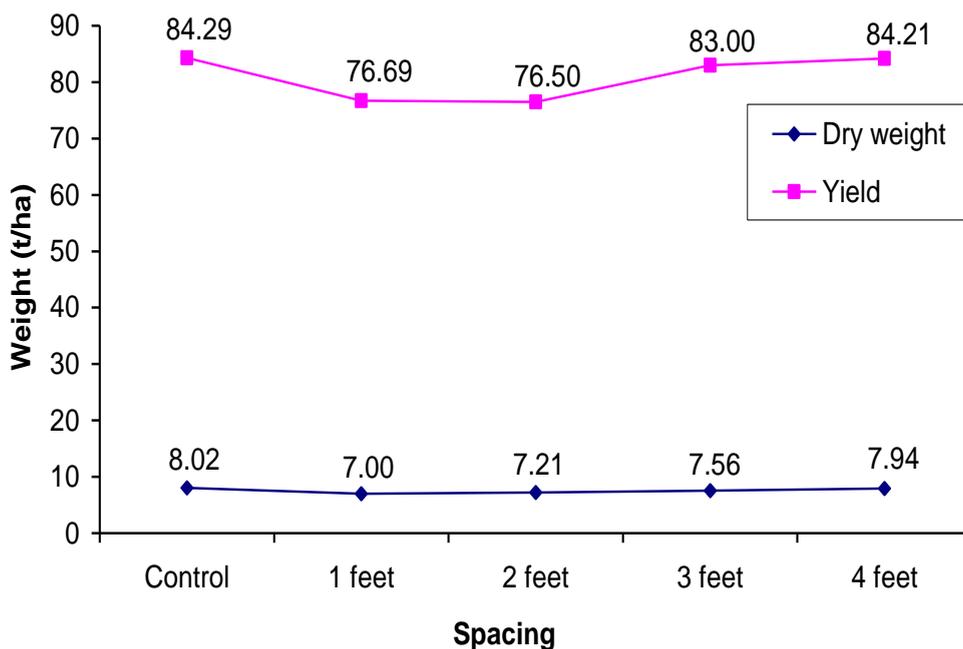


Fig 4: Dry weight and yield of kalmishakh in association with *Hopea odorata*

### Conclusion

The highest vegetable production was recorded under 4 feet distance from Telsur sapling which was statistically similar with control and the lowest vegetable production was observed under 1 feet distance from Telsur sapling.

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