

SURVEY OF CULTIVATED VEGETABLE CROPS IN RUPANDEHI DISTRICT, NEPAL

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ABSTRACT

Vegetable is very nutritious food and is considered to be protective food since it contains high amount of vitamins and minerals and also possesses medicinal value. In the present study, documentation of farmer's knowledge on cultivated vegetable crops was carried out in Rupandehi district during the year 2016. The objective of this paper is to identify, enumerate and to know the status of vegetable crops in this district. It was carried out by conducting semi-structured interview with the vegetable growing farmers, local people, members of Community Based Organizations with the help of standard questionnaire, checklist, Focus Group Discussion (FGD) and key informant interview. Altogether 50 plant species have been found to be cultivated in commercial scale as vegetable crops in Rupandehi district. Out of 50 plant spp.; 2 families, 4 genera and 5 spp. were monocots; and 9 families, 30 genera and 45 spp. were dicots. It is also found that fruit (55%) is the widely used part of plant as vegetable. Other parts like leaf (21%), inflorescence (4%), root (8%), tuber (2%), corm (6%), and bulb (4%) are also used as vegetable. Most of the vegetable growing farmers (91%) are economically benefited by the cultivation and selling of vegetable than other crops due to easily available seeds, fertilizers and pesticides in market; good facility of irrigation and accessible market in the study area.

Key words: Herbarium; off seasonal vegetable; Rupandehi, vegetable growing farmers, vegetable growing pocket area.

INTRODUCTION

Richness in genetic diversity of plants in Nepal is evident from the fact that more than 7000 species of flowering plants are estimated to be growing in the country and 79% of them have been collected, identified and preserved in the National Herbarium and Plant Laboratories, Godawari (NAA. 1995). Out of 7000 species, 400 comprise of food and horticultural crops, and of them, 200 species are in vegetable category (NAA. 1995). Vegetables are less risky, fast growing and best sources of income in comparison to other cereal crops. Due to the market access and increasing demand of vegetables, area for cultivation and productivity of vegetables is also increasing over the years. Commercialization of vegetable cultivation

requires establishing markets and trading centers with adequate storage facilities close to farmer's production centers.

Nepal is an agricultural country where almost 65 percent people are involved directly and indirectly in agriculture (CBS, 2012). Agro-ecological variation in our country is high from Terai to high hills where many of the vegetables can be grown successfully. Production and productivity of the agricultural commodities in our country is still low as compared to other countries in spite of 65% people engaged in agriculture. According to the Central Bureau of Statistics (2009-10) and Ministry of Agriculture and Cooperatives (MoAC), vegetable crops are cultivated in only 7.3 percent of the total cultivable land in Nepal.

The history of development of vegetables in Nepal dates back in early forties; however, its rapid development was started from 1972 when Vegetable Development Directorate (VDD) was established in the Department of Agriculture (Awasthi, 2003). Introduction and domestication of vegetables is an integral part of Nepalese agricultural systems. Both indigenous and exotic vegetables were cultivated in gardens of Ranas during the mid-19th century. At present, there are more than 247 cultivated vegetable crops throughout the world and more than fifty species of vegetables have already been domesticated in Nepal. Different forms of vegetables e.g. annual, biennial, perennial, herbs, shrubs, trees and climbers exist in Nepal. Due to wide range of climatic conditions ranging from tropical to alpine zone, it is possible to grow almost all types of vegetables in Nepal. Low hill farmers cultivate about 85% of the total local vegetables and mid hills farmers about 11%. The cultivation of local vegetables is the lowest (32%) in the high hills. High hill farmers mostly rely on wild vegetables (Buthathowki *et al*, 1993).

Different vegetables related organizations working in different parts of Nepal enhance the vegetables cultivation practices, collection and diversity maintenance of vegetables. Some of many indigenous vegetables have originated from Nepal. Intensive cultivation of vegetables is generally linked to availability of market. Due to the market facility in Terai different types of vegetables are being cultivated. Rupandehi is one of the Terai districts in Nepal where people cultivate different types of vegetable crops since ancient time. But no intensive research has been carried out to identify and enumerate the cultivated vegetable crops as well as to know the status of vegetable growing farmers in this district. So, this papers aims to identify the status of cultivated vegetable crops in Rupandehi

district.

MATERIALS AND METHODS

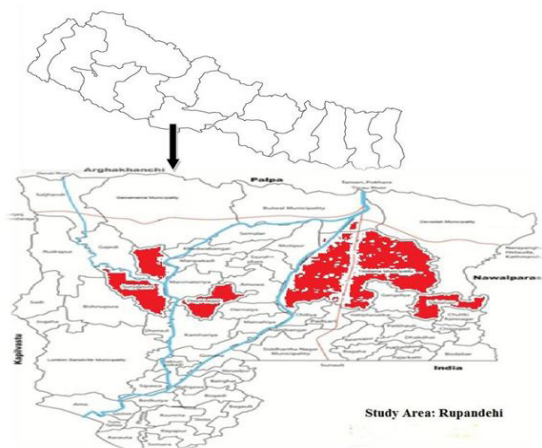
Study Area

The study area Rupandehi District (latitudes: 27°20'00" N to 28°47'25" N, longitudes: 83°12'16" E to 83°38'16" E), lies in Lumbini Zone, Western Development Region of Nepal. It borders India in South, and Palpa, Nawalparasi and Kapilvastu district in the North, East and West respectively. The altitude ranges from 100 m to 1229 m above sea level. The district covers an area of 1,360 sq. km. The district is divided into fifty two village development committees (VDCs), five municipalities and one sub-metropolitan city. Geographically, it is divided into Chure region (14.5%); Bhabar region (0.6%) and Terai region (84.9%).

It has lower tropical (below 300 m), upper tropical (300- 1000 m) and sub-tropical (1000-2000 m) climate with maximum temperature about 43.7°C during summer (May- June) and about 8.75°C during winter (December-January) and annual rainfall is about 1808 mm. Pre-monsoon precipitation of 274.15 mm on an average is received in June and the maximum rainfall received for the observed period is 1034.5 mm. Similarly, post monsoon month September is comparatively wet month that receives an average of 283.56 mm rainfall.

Rupandehi is agriculturally important south western district of Nepal. More than half of the land in the district (58.45 per cent or 82,622 ha) is under cultivation and 70 per cent (98,956) of population are engaged in agriculture (Census, 2011). Major cereal crops produced in the district are paddy, wheat, corn, and finger millet; pulses are kidney bean, black gram, and soybean; and oilseed crops are mustard, sunflower, and peanuts. Among horticultural crops, the major fruits are mango, banana, litchi, jackfruit, and guava and the major vegetables are onion,

potatoes, cabbage, cauliflower, tomatoes, radish, cucumber, ole, bottle gourds, and pumpkin. In addition to that, some spices and condiments are grown in the district such as turmeric, chili, and garlic.



Data Collection

Both primary and secondary sources of information were used. The primary data were collected by extensive four time field survey of field visits of about one week each during the year 2016. Semi-structured questionnaires and checklist were applied for community survey. Personal interview, Focus Group Discussion (FGD) and key informant interview were also conducted with vegetable growing farmers, local people, elder people and the members of the Community Based Organizations (CBOs) to collect the different aspects of vegetable cultivation data in the study area.

Plant Collection, Herbarium Preparation and Identification

Most of the important vegetable species available in the study area were identified with the help of farmers and local people. Other unidentified plant specimens were collected for future reference. Collected plant samples were tagged, dried and mounted as voucher herbarium specimens following the standard technique

(Lawrence 1967). The unidentified specimens were later confirmed by consulting books and other standard taxonomic literatures (Hara *et al.* 1978, 1979, 1982; Polunin and Stainton 1984; Stainton 1988) and comparing with specimens deposited at Tribhuvan University Central Herbarium (TUCH) and National Herbarium (KATH). The prepared herbarium specimens were submitted to Department of Botany, Butwal Multiple Campus, Butwal.

RESULT AND DISCUSSION

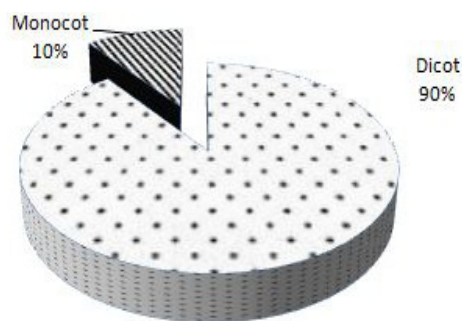


Fig1: Major Types of Taxa of Vegetable Crops

Altogether 50 plant species were found to be cultivated in commercial scale as vegetable crops in Rupandehi district. Out of 50 plant spp.; 2 families, 4 genera and 5 spp. were monocots; and 9 families, 30 genera and 45 spp. were dicots (Table: 1). Among them 90% species were dicots and 10% species were monocots. Some of the monocot spp. are *Allium cepa* L.(Onion), *Allium sativum* L.(Garlic), *Alocasia macrorrhizos* (L.)G. Don (Giant Taro), *Amorphophallus paeonifolius* (Demst) Nicolson (Elephant Foot Yam), and *Colocasia antiquorum* Schott. Var. *esculenta* L.(Yam). Major dicot vegetable crops are *Abelmoschus esculentus* (L.) Moench (Lady's finger), *Brassica oleraceae* var. *botrytis* L. (Cauliflower), *Brassica oleraceae* var. *capitata* L. (Cabbage), *Brassica oleraceae* var. *italica* L. (Broccoli), *Brassica rapa* L. (Turnip), *Cucumis sativus* L. (Cucumber), *Cucurbita*

maxima D. Don. (Pumpkin), *Lagenaria siceraria* (Molina) Standl. (Bottle gourd), *Daucus carrota* L. var. *sativa* DC. (Carrot), *Luffa cylindrica* (L.) Roem. (Sponge gourd), *Lycopersicon esculentum* Mill (Tomato), *Solanum tuberosum* L. (Potato), *Raphanus sativa* L. (Radish), *Vigna sinensis* (L.) Savi ex Hassk (Cow pea), *Solanum melongena* L. (Brinjal) etc.

Table: 1 Name of Vegetable Crops Cultivated in Study Area.

Scientific Name	English Name	Local Name	Family	Parts Used
<i>Abelmoschus esculentus</i> (L.) Moench	Lady's finger/Okra	Bhindi	Malvaceae	Fruit
<i>Allium cepa</i> L.	Onion	Pyaj	Amaryllidaceae	Bulb/Leaf
<i>Allium sativum</i> L.	Garlic	Lasun	Amaryllidaceae	Bulb/Leaf
<i>Alocasia macrorrhizos</i> (L.) G. Don	Giant Taro	Thulo Pindalu	Araceae	Corm
<i>Amaranthus caudatus</i> L.	Love-lies-bleeding	Latteko Sag	Amaranthaceae	Leaf
<i>Amorphophallus paeonifolius</i> (Demst) Nicolson	Elephant Foot Yam	Oal	Araceae	Corm
<i>Anthum sowa</i> Roxb.	Indian Dil	Sounp Sag	Umbelliferae	Leaf
<i>Benincasa hispida</i> (Thunb.) Cogn	Wax Gourd	Kuvindo	Cucurbitaceae	Fruit
<i>Beta vulgaris</i> L.	Beetroot	Gulio Mula/ Chukandar	Amaranthaceae	Root
<i>Brassica campestris</i> L.	Indian Rape	Toriko Sag	Brassicaceae	Leaf
<i>Brassica juncea</i> var. <i>foliosa</i> Bail.	Broadleaf Mustard	Rayo Sag	Brassicaceae	Leaf
<i>Brassica oleraceae</i> var. <i>botrytis</i> L.	Cauliflower	Phulgobi	Brassicaceae	Inflorescence
<i>Brassica oleraceae</i> var. <i>capitata</i> L.	Cabbage	Bandagobi	Brassicaceae	Leaves
<i>Brassica oleraceae</i> var. <i>italica</i> L.	Broccoli	Brocauli	Brassicaceae	Inflorescence
<i>Brassica rapa</i> L.	Turnip	Salgam	Brassicaceae	Root
<i>Canavalia ensiformis</i> (L.) DC.	Sword bean	Tarbare/Tate simi	Fabaceae	Fruit
<i>Capsicum frutescens</i> L. var. <i>cerasiforme</i> L.H. Bailey	Cherry Pepper	Jyanmara Khursani	Solanaceae	Fruit
<i>Capsicum frutescens</i> L. var. <i>conoides</i> L. H. Bailey	Cone Pepper	Dallay Khursani	Solanaceae	Fruit
<i>Capsicum frutescens</i> L. var. <i>grossum</i> L.H. Bailey	Bullnose Chilly	Bhende Khursani	Solanaceae	Fruit
<i>Capsicum frutescens</i> L. var. <i>longum</i> L.H. Bailey	Long Pepper	Jire Khursani	Solanaceae	Fruit
<i>Chenopodium album</i> L.	Goosefoots	Betheko Sag	Chenopodiaceae	Leaf/Young shoot
<i>Coccinia grandis</i> (L.) Voigt	Ivy Gourd	Kunru	Cucurbitaceae	Fruit
<i>Coriandrum sativum</i> L.	Coriander	Dhaniya	Umbellifereae	Leaf
<i>Colocasia antiquorum</i> Schott. Var. <i>esculenta</i> L.	Yam	Pindalu	Araceae	Corm/Leaf
<i>Cucumis sativus</i> L.	Cucumber	Kankro	Cucurbitaceae	Fruit
<i>Cucurbita maxima</i> D. Don.	Pumpkin	Pharsi	Cucurbitaceae	Fruit/Leaf shoot
<i>Daucus carrota</i> L. var. <i>sativa</i> DC.	Carrot	Gajar	Umbelliferae	Root

<i>Lagenaria siceraria</i> (Molina) Standl.	Bottle Gourd	Louka	Cucurbitaceae	Fruit
<i>Lepidium sativum</i> L.	Peper Cres	Chamsur Sag	Brassicaceae	Leaf
<i>Luffa acutangula</i> (L.) Roxb.	Ridge Gourd	Pate Ghiraula	Cucurbitaceae	Fruit
<i>Luffa cylindrica</i> (L.) Roem.	Sponge Gourd	Ghiraula	Cucurbitaceae	Fruit
<i>Lycopersicum esculentum</i> Mill	Tomato	Golbheda	Solanaceae	Fruit
<i>Momordica balsamina</i> L.	Balsam apple	Barela	Cucurbitaceae	Fruit
<i>Momordica charantia</i> L.	Bitter Gourd	Titekarela	Cucurbitaceae	Fruit
<i>Momordica dioica</i> Roxb.	Spiny Gourd/Teasle Gourd	Jangali Karela/Kheksi	Cucurbitaceae	Fruit
<i>Moringa oleifera</i> Lam.	Drumsticks	Sahijan	Moringaceae	Fruit
<i>Phaseolus lunatus</i> L.	Lima Bean/ Butterbean	Hiude Simi	Fabaceae	Fruit
<i>Phaseolus vulgaris</i> L.	Common Bean	Asare Simi/Lauri Simi	Fabaceae	Fruit
<i>Pisum sativum</i> L.	Garden Pea	Matar/Kerau	Fabaceae	Fruit
<i>Raphanus sativa</i> L.	Radish	Mula	Brassicaceae	Root
<i>Sachium edule</i> (Jacq.) Sw.	Chayote	Iskush	Cucurbitaceae	Fruit
<i>Solanum melongena</i> L.	Brinjal/Egg plant	Bhanta/Baigun	Solanaceae	Fruit
<i>Solanum tuberosum</i> L.	Potato	Aalu	Solanaceae	Tuber
<i>Spinacea oleracea</i> var. <i>inerrus</i> L.	Round Seeded Spinach	Palungo Sag	Chenopodiaceae	Leaf
<i>Trichosanthes anguina</i> L.	Snake Gourd	Chichindo	Cucurbitaceae	Fruit
<i>Trichosanthes dioica</i> Roxb.	Pointed Gourd	Parbar	Cucurbitaceae	Fruit
<i>Trigonella foenumgraceum</i> L.	Fenugreek	Methi Sag	Fabaceae	Leaf
<i>Vicia feba</i> L.	Broad Bean	Bakula Simi	Fabaceae	Fruit
<i>Vigna sinensis</i> (L.) Savi ex Hassk	Cow Pea	Tane Bodi	Fabaceae	Fruit
<i>Vigna unguiculata</i> var. <i>Sesquipedalis</i> (L.) Verdc	Yard-long Bean	Lamo Tane Bodi	Fabaceae	Fruit

There are fifteen pocket areas for the commercial production of vegetables in Rupandehi districts viz. Dhakdhakai, Parroha, Gajedi, Khudabagar, Dhamauli, Suryapura, Harnaiya, Kamhariya, Rayapur, Jogada, Majhagawan, West Amuwa, Siktahan, Siddharthanagar municipality and Devdaha municipality (DADO, 2072).

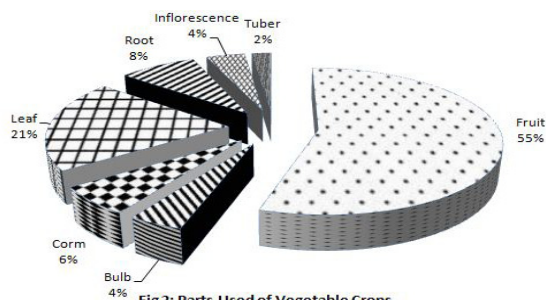


Fig 2: Parts Used of Vegetable Crops

The present research has found that fruit (55%) is widely used part of plant as vegetable. Other parts like leaf (21%), inflorescence (4%), root (8%), tuber (2%), corm (6%), and bulb (4%) are also used as vegetable. Fruit is large and most

nutritive as well as delicious part of plant so people consume it as vegetable.

Underground parts like tuber of *Solanum tuberosum*, corm of *Colocasia antiquorum* Var. *esculenta*, and bulb of *Allium cepa* are most widely used as vegetable in study area.

Farmers cultivate vegetables in both summer (rainy) and winter seasons. The summer season vegetables are *Lagenaria siceraria* (Molina) Standl. (Bottle gourd), *Vigna sinensis* (L.) Savi ex Hassk (Cow pea), *Momordica charantia* L. (Bitter gourd), *Solanum melongena* L. (Brinjal), *Solanum melongena* L. (Sponge gourd), *Luffa acutangula* (L.) Roxb. (Ridge gourd), *Trichosanthes anguina* L. (Snake gourd), *Trichosanthes dioica* Roxb. (Pointed gourd), *Cucurbita maxima* D. Don. (Pumpkin), *Abelmoschus esculentus* (L.) Moench (Lady's finger), *Benincasa hispida* (Thunb.) Cogn (Wax gourd), *Coccinia grandis*(L.) Voigt (Ivy gourd), *Momordica dioica* Roxb. (Spiny gourd), *Cucumis sativus* L. (Cucumber) etc. Similarly the winter season vegetables are *Brassica oleraceae* var. *botrytis* L. (Cauliflower), *Brassica oleraceae* var. *capitata* L. (Cabbage), *Brassica oleraceae* var. *italica* L. (Broccoli), *Lycopersicon esculentum* Mill (Tomato), *Solanum tuberosum* L. (Potato), *Daucus carota* L. var. *sativa* DC. (Carrot), *Raphanus sativa* L. (Radish), *Allium cepa* L. (Onion), *Allium sativum* L. (Garlic), *Pisum sativum* L. (Pea) etc.

The vegetable growing farmers cultivate different types of seasonal as well as off seasonal vegetable crops in their farm by using different types of pesticides in the study area. The amount of off seasonal vegetables they cultivate is very less as compared to seasonal vegetable crops due to difficult in pest control and field management. Off- season vegetable production is defined as the production of vegetable after or before their normal season of

production. Off seasonal vegetable crops are more susceptible to pest than seasonal crops, so they use more pesticides in high dose frequently in these vegetables. Government of Nepal has launched the Commercial Offseason Vegetable Production Pocket Program in 17 hilly districts during the fiscal year 2070/71. In Nepal, the amount of vegetable production was 13,419 kg per hectare during 2013/14 and 13,412 kg per hectare in 2014/15 (MoAD, 2015). The total amount of cultivated area for vegetable in Terai was 1,70,736 hectare and the total production was 70,681 kg per hectare (VDD, 2015). Similarly the total cultivated area for vegetable in Rupandehi was 4,716.5 hectares and the total production during 2071-072 was 1,19,213.1 metric tons (DADO, 2072). Fifteen vegetable growing pocket areas are selected in Rupandehi district to produce vegetable crops in commercial scale. DADO, Rupandehi has launched 'Youth Centered Commercial Vegetable Production Program' to involve the youth (18-50 years age group) for the production and export of vegetable. Sixty youth farmers were selected to conduct this program during 2071-2072 (DADO, 2072). For this program youth farmers receive some grant from DADO, Rupandehi and cultivate vegetable in commercial scale. They produce vegetable to sale in Nepali market but some of them export to India to some extent. Few amount of vegetable is also imported to Rupandehi district through Belhiya (Sunauli) boarder. Nepal imports different types of vegetable from India which amounts to 64,441 metric tons and cost NRs 17,75,224 through Belhiya (DADO, 2072).

Most of the vegetable growing farmers (91%) are economically benefitted by the cultivation and selling of vegetable than other crops due to easily available seeds, fertilizers and pesticides in market; good facility of irrigation and accessible

market in the study area. It has become the main source of income to support the livelihood for them. Vegetable crops are efficient to generate cash even from a small plot of land in a short period of time and helps farmers reduce poverty. The value of vegetable production equals or even surpasses the value of cereal production (Gurung *et.al* 2016). There are many small markets (Hatbazaar) in study area. They also sell vegetables in big markets like Manigram, Valbari, Kotihawa, Jogikuti, Patkhauli bazaar, Birta bazaar, Bhairahawa, Butwal etc. They also export vegetables to India due the presence of nearby border. They sell vegetable themselves in market or sell to vegetable broker. Most of them sell vegetable to the broker to save their time in the market. There are some collection centers for vegetable in the study area but most of them transport vegetable personally. Some of the farmers collectively do the reservation of jeep/van to transport the vegetable. It has been found that vegetable growing farmers cultivate vegetable in 5 katha to 2 Bigha land in the study area. Most of the farmers cultivate vegetable in traditional way since a long time. They are illiterate and ignorant and did not know about modern technique of vegetable cultivation and pesticide use. Sometimes District Agricultural development Office (DADO) and some NGOs conduct training program to cultivate vegetable in modern technique, method of proper use and safe handling of pesticides, preparation and use of botanical pesticides etc. Such training is given to only limited number of farmers. DADO, Rupandehi has launched 'Youth Centered Commercial Vegetable Production Program' for the farmers of age group 18 to 50 years. This program provides some grant for commercial production of vegetable.

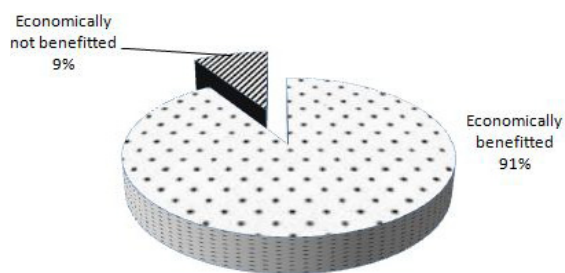


Fig: 3 Economic Status of Farmer

Some farmers (9%) did not get benefit by the cultivation of vegetable crops in the study area. In some places, there is a lack of irrigation and transportation facility. Nilgai also causes a heavy loss of vegetable in few wards of Dayanagar and Suryapura VDC, which are adjoining to Lumbini conservation area. They also got loss due to high incidence of pest, ineffectiveness of pesticide and high production rate but minimum selling rate and low price rate of vegetable in the market. Sometimes vegetable gets rotten at the farm due to the lack of storage facility, transportation facility and low selling rate in the study area.

CONCLUSIONS

The study area is rich in indigenous and exotic vegetable crops. Local people cultivate different types of summer, winter and off seasonal vegetable crops in their field but in commercial scale they cultivate 50 plant species as vegetable crops. Dicots are widely used as vegetable crops than monocots. The amount of off seasonal vegetables they cultivate is very less as compared to seasonal vegetable crops due to difficult in pest control and field management. Most of the vegetable growing farmers are benefitted by the cultivation of vegetable crops than other crops due to the availability of facilities like seeds, fertilizers, pesticides, transportation, market, irrigation etc. in the study area. To increase the participation of local people for the cultivation of vegetable crops, concerned Government

agencies should manage the transportation of vegetable from farm to the market and the number of vegetable collection centers should be increased and well organized. Illegal import of vegetable from India should also be banned to encourage farmers in the study area. Nilgai, present in Lumbini Conservation area, should be controlled by concerned authorities otherwise they should provide compensation of loss caused by them in the study area, especially in Dayanagar and Suryapura VDCs.

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