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**National Conference On
Advancement of Science and Technology for
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(NCASTESP-2022)
(28 August 2022)**

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of the
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Kozhikode, Kerala, India
(28 August 2022)

Editor

Devi Dayal

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Design and development of automated nutrient regulation system for hydroponics unit

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ABSTRACT: Soil is the most important component for plant growth that supports plant roots, supplies water, air and nutrients. However, soil do impose severe constraints like unsuitable soil conditions, unfavourable soil compaction, poor drainage, soil borne diseases, room for disease causing microorganisms. Growing land, water and labour are other constrains in urban areas. Hence, the conditions directed to soil less culture in small- and large-scale production of crops. In soil less culture especially, hydroponics, the problem of regular maintenance of nutrient solution and required technical knowledge. The automation in hydroponics further helps to boom up the hydroponic cultivation. Automated nutrient regulation in hydroponics environment with automatic nutrient feed technology was developed and tested in the present study. The paper presents automated controlling and regulation of pH, TDS, temperature in polyhouse hydroponic system using Arduino-Uno controller, solenoid valves containing nutrients, water, pH-up, and pH-down and sensors. In this study, the sensors are connected to Arduino-Uno Controller in which liquid crystal display (LCD) of Arduino-Uno circuit controls and regulates the system based on the coding which has been programmed previously. Calibration was done for all the parameters in the automated system. TDS and pH values of nutrient solution were recorded by using TDS and pH sensor probes respectively were fed to Arduino which adjusts the values, if required, through actuators. The prototype model was able to monitor and control the pH and EC of hydroponic water in the required range accurately.

Key words: pH, EC, Arduino Uno, Solenoid valves, Hydroponics, Sensors.

Soil chemical properties and soil carbon pools as affected by different land use in the foothills of Kolasib district, Mizoram

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ABSTRACT: Land use systems has a profound effect on soil chemical properties and soil carbon pools through leaf litters, root exudates etc. Soil properties including soil carbon pools and stock is important as its decomposition and variability may affect carbon cycle and climate variability. Five land use systems namely lowland paddy, abandoned jhum, teak, secondary forest and arecanut were selected in the foot hills of Kolasib district, Mizoram (<300 m asl) upto 45 cm depth (0-15, 15-30, 30-45 cm), north east India. Results suggested that land use had variable effect on the soil properties. Soil pH ranged between 4.6 to 5.5 and the SOC was highest in forest (11.9 mg g⁻¹) compared to jhum (7.3 mg g⁻¹) irrespective of the soil depth. The available P was highest in forest (8.07 kg ha⁻¹) and jhum (8.14 kg ha⁻¹) and least in teak (2.96 kg ha⁻¹) and K was highest in jhum soil (402.02 kg ha⁻¹). The soil C stock was highest in forest (27.18 Mg ha⁻¹) and least in jhum (20.39 Mg ha⁻¹). The non-labile C pools ranges between 3.4 mg g⁻¹ in forest to 2.53 mg g⁻¹ in rice irrespective of the soil depth while the less labile pool between 2.8 mg g⁻¹ in forest to 1.82 mg g⁻¹ in jhum soil. The labile pool ranges between 3.84 mg g⁻¹ in forest to 2.87 mg g⁻¹ in jhum while the very labile C pools between 5.27 mg g⁻¹ in forest to 2.64 mg g⁻¹ in jhum respectively. All the C pools decreased with an increasing soil depth. The active C pool constitute 58.87 % to the total C in forest soil to 53.83% in jhum soil whereas the passive pools constituted 41.13% in forest soil to 46.17% to TOC in jhum soil. Thus, the very labile C pools has the most significant variation and can be used as an indicator of soil health induced by land use change in hills of the region.

Keywords: Hill, slope, carbon fractions, soil health, climate change

Effect of weaning of *Lumsniang* piglets at 35 days of age on piglets and sow in Mizoram agro-climatic conditions

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ABSTRACT: The study was conducted to investigate the effect of early weaning (i.e. 35 days) of piglets on *Lumsniang* young pigs during pre and post-weaning periods i.e., from day 0 to 70 and sow in the agro-climatic condition of Mizoram. A total number of 48 (8 litters) *Lumsniang* young pigs in their respective litters were randomly divided into two groups viz., Control (C), where the piglets were weaned at 49 days old and Treatment (T) where piglets were weaned at 35 days old, in such a way that there were 4 replicates in each group with 1 litter as one replicate. Statistical analysis of the data revealed significant ($P < 0.05$) improvements in ABW (Average Body weight) on 56, 63 and 70 days of age, significantly ($P < 0.05$) improved ADG (Average Daily Weight Gain) on 1st, 4th, 5th and 10th weeks of age, in young pigs weaned on 35 days as compared to piglets weaned at 49 days. However, there were no significant difference in ABW of young pigs on 0, 7, 14, 21, 28, 35, 42 and 49 days of age and likewise, no significant difference was observed on the ADG of young pigs on 2nd, 3rd, 6th, 7th, 8th and 9th weeks of age between Control and Treatment groups. Apart from observable improvement in ABW and ADG of young pigs in the Treatment group, the piglets weaned at 5th week are more sturdy and more adaptable to new environment when they reach 7th week. Since sows usually come into heat at 7-10 days post weaning, sows from Treatment group come into heat earlier (i.e. 42-45 days from parturition) as compared to sows from Control group that come into heat at 57-65 days from parturition. The present study may be concluded that, in the agro-climatic conditions and the present pig farming practices in Mizoram, weaning of piglets at 35 days of age will greatly improve the pig production in terms of economic, production and reproduction performances.

Keywords: Mizoram, *Lumsniang*, piglets, weaning, 35 days, average body weight, average daily gain.

Role of online software and mobile apps in soil nutrient management in cashew

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ABSTRACT: One of the major constraints in realizing the potential yield in cashew is the limited attention given by growers on nutrient management in cashew. The application of the right quantity of required fertilizer at the right time is vital for the judicious management of resources and for achieving the maximum benefit and income. Due to the wide variability in field conditions, and availability and choice of fertilisers, the farmers cannot correctly determine the right quantity of fertiliser to be applied and they may have to depend on scientists and extension personnel to get information on the correct doses. For empowering the farmers to take informed decision by themselves, a software and a mobile App for nutrient management in cashew was prepared under the project funded by RKVY-RAFTAAR at ICAR-Directorate of Cashew Research, Puttur. This software is available in both English and Kannada. It is available on the ICAR-DCR website for calculating fertilizer requirement, lime requirement, foliar application of major and micronutrients. The deficiency symptoms of major and micronutrients commonly observed in the field also included in the software. The farmers can click on the images and understand the symptoms and find out the options to correct the deficiency. The software also lets the farmers download the soil health card issued by ICAR-DCR, Puttur. The link to the software is <https://cashew.icar.gov.in/soil> . The mobile app version of the software is also available in Google playstore. A separate mobile app exclusively for nutrient deficiency identification and management is also available.

Keywords: Cashew, Mobile app, Androd, Software, Nutreint Management

Morphological Characterisation of Aromatic and Non-aromatic Farmers' Varieties of Rice (*Oryza sativa* L.) Based on grain type

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ABSTRACT: The landraces of rice play important role as donor in breeding of varieties for desirable traits. One hundred twenty-one Farmers' Varieties (FVs) of rice collected from West Bengal, Assam and Manipur had used to characterize physical parameters of seeds. Based on the kernel length and L/B ratio, most of the FVs were found to be long bold (31 FVs) and short bold (47 FVs). Out of remaining 43 FVs, 27 were long slender, 03 were short slender and 11 were medium slender. Rice seeds were also classified based on test weight. Most of the FVs were medium heavy (50 FVs) and medium heavy (27 FVs). The yield of the FVs varied from 0.91 t/ha to 5.19 t/ha. Jadudhan (5.19 t/ha) was found to be maximum seed yielding genotype followed by Jaldhyapa-1 (4.92 t/ha), Jagratikartik (4.69 t/ha), Jamainaru (4.68 t/ha), Kerala Sundari (4.58 t/ha), Satiya (4.44 t/ha), Dubari Komal (4.32 t/ha), Jugal (4.08 t/ha), Boichi (4.06 t/ha), Patanai (4.06 t/ha), UBL-4 (4.05 t/ha) and Khayamdhan (4.01 t/ha). From this collection, donors may be selected for breeding long grained rice as well as rice with high test weight.

Keywords: Rice, traditional varieties, seed physical characters, seed yield

Quantitative predictive relationship between soil quality and cotton + greengram intercropping system productivity in Vertisols under semi-arid conditions

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Abstract: Systematic research on the effect of long-term integrated nutrient management practice on soil quality (SQ), and system productivity under cotton + greengram (1:1) intercropping system especially under semi-arid climate is limited. Therefore, the study was

conducted during 2020-2021 on a long term field experiment initiated during 1987-88 with eight treatment combinations including sole organics, sole inorganics, and integration of organics to substitute for the fertilizer N requirement (INM) in the cotton + greengram intercropping system under semi-arid agro-ecosystem of Vidarbha region in Maharashtra, India. The results revealed that, the highest seed cotton, greengram grain yield and system productivity were observed under treatments where 50% N was substituted either through gliricidia or farm yard manure (FYM) along with recommended dose of P and K through fertilizers. The highest SQI was obtained in the INM treatments followed by 100% RDF, while the lowest was in control. The key SQ indicators identified for this region were soil organic carbon (SOC), available nitrogen (AN), mean weight diameter (MWD), and alkaline phosphatase (Al.P). The quantitative relationship between SQ and system productivity was established, which indicates that the critical SQI score for achieving maximum system productivity (1543.96 kg ha⁻¹) of cotton + greengram intercrop under rainfed conditions was 1.81. For this, the critical values of SOC and AN (key SQ indicators) were estimated to be 6.5 g kg⁻¹ and 253 kg ha⁻¹, respectively. Therefore, this much amount of SOC and AN must be maintained in Vertisols of semi-arid agro-ecosystem in order to sustain system productivity of cotton + greengram intercropping in Vertisols under rainfed conditions.

Keywords: Vertisols, Cotton + greengram intercropping, INM, soil quality, system productivity.

Value Addition of Aonla (*Emblica officinalis*. Gaertn) nectar with different varieties

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ABSTRACT: Aonla (*Emblica officinalis* L.) is an important fruit crop indigenous to Indian sub-continent, which can be grown successfully in dry and neglected regions. The farmers are trying different varieties for growing as a commercial orchard without having knowledge about the performance of these varieties. A research experiment was conducted during the year 2019-20 and 2020- 21 in the Fruit and Vegetable Processing Unit Laboratory, Department of Horticulture, College of Agriculture, Gwalior with seven different varieties of aonla viz., NA-4, NA-5, NA-6, NA-7, NA-10, Laxmi and Chakaiya. These varieties have also higher

productivity and fruits are free from necrosis or internal browning, hence, they are considered to be ideal varieties for processing. Studied about the preparation of value added product- aonla nectar. Observations were recorded up to storage period of six months at ambient conditions. This study is analyzed in a completely randomised design with three replications. NA- 10 and Chakaiya varieties was found superior with respect to colour and appearance, taste, aroma as well as flavour. It has been noticed that the overall acceptability of processed products have been found significant with the respect to 30, 60 , 90 and 120 days of storage. As far as organoleptic and nutritional evaluation of different aonla toffee was concerned, the Laxmi and Chakaiya varieties are found to be superior for the purpose of processing industry. The postharvest losses in aonla vary from 30-40% due to its perishable nature and glut during harvesting time, which reduces the market value of fruit. Hence, value addition through processing would be the only effective tool for economic utilization of increased production of aonla in future.

Keywords: Aonla, preparation, processing industry, storage and value addition.

Augmenting Seed Yield and Seed Quality of Mungbean [*Vigna radiata* (L.)Wilczek] through Foliar Application of Micronutrients

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ABSTRACT: The experiment was designed to find out the influence of different doses of zinc, magnesium and iron on yield and seed quality of mungbean variety Sweta and Virat. The field experiment and laboratory experiment were conducted during *Zaid* 2019 on mungbean at Crop Research Farm, Nawabganj, Kanpur and Seed Testing Laboratory of Department of Seed Science and Technology, respectively. Three doses (0, 0.5 and 1.0 per-cent) of each micronutrient namely Zinc, Magnesium and Iron were sprayed twice 20 & 35 DAS. Observations were recorded on seed yield and yield attributing characters and seed quality parameters. Results showed that the application of zinc, magnesium and iron affected significantly to all parameters. The dose of 1.0% zinc reduced the days to initiation of flowering (36.83 days), days to 50% flowering (42.33 days) and recorded highest seed yield (1.48 Kg plot⁻¹ and 1095.81 Kg ha⁻¹), root length (9.07 cm), seedling length (29.97 cm) and seedling

vigour index-I (2970.12). The dose of 1.0% magnesium recorded highest number of pods plant⁻¹ (50.17) and dry weight (0.241 gm). The dose of 1.0% iron recorded highest number of primary branches plant⁻¹ (2.33), number of seeds pod⁻¹ (11.37), seed germination (99.5%), shoot length (21.85 cm), 1000 seed weight (45.00 gm) and seedling vigour index-II (24.02). Like-wise, maximum pod length (7.41 cm) was noticed in var. Virat (V₂). How-ever variety did not influence seed yield. Hence, 1.0% spraying of zinc, magnesium and iron at 20 & 35 DAS may be recommended to seed growers for realizing maximum yield and seed quality of mungbean.

Keywords: Micronutrients, Foliar spray, Mungbean, Yield attributing characters.

Assessment of combining ability effects in maize (*Zea mays* L.) for grain yield under drought stress environments

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ABSTRACT: Combining ability tests own pre-potency in selection of parents which is the step of utmost importance in heterosis breeding. The present experiment was performed on 45 single cross hybrids (developed by crossing 15 inbreds with 3 testers in Line × Tester mating design), 18 parents and 3 checks to assess combining ability effects for grain yield in a RBD with 3 replications, over three environments - optimal, drought stress at tasseling stage and drought stress at grain filling stage environments, during *spring* 2021, at Rajasthan College of Agriculture, Udaipur. The perusal of data, on pooled basis, expressed that genotypes, lines, testers and line × tester components of variance were significant for grain yield per plant. The inbred lines *viz.*, EI-2188-2, EI-2448 and EI-03-3, and tester EI-2156 were noted as good general combiners with positive and significant GCA over all the environments. Among the hybrids, 14 crosses demonstrated positive and significant SCA effects, out of which EI-08 X EI-586-2, EI-12-2 X EI-586-2, EI-2448-1 X EI-2156 and EI-2521 X EI-670-2 were recognized as most outstanding hybrids over all the environments. Therefore, these hybrids should be subjected to multi-location testing and inbreds should be considered in further breeding endeavors aimed at maize yield enhancement under drought conditions.

Keywords: General combining ability, Specific combining ability, Maize, Drought stress, Grain yield per plant.

Mobilizing Indigenous Knowledge for Climate Change Adaptation

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ABSTRACT: Global climate change is the reason for the frequently and stressful rate of natural disasters, causing tremendous impacts on many different areas such as economy, culture, society and environment. Climate change is one of the most important challenges to sustainable development. Indigenous Knowledge and related activities are becoming more and more valuable as the community strives to build capacity to adapt to the potential future impacts of climate change (Kalanda,2011). Indigenous Knowledge provides additional solutions, options in the process of adaptation to climate change. As a result, local people have more choices when offering solutions and models that are suitable for the community to adapt to climate change rather than depending on external factors. Determination of production options using indigenous knowledge to adapt to Climate Change based on community participation, is in fact the process to identify the climate resilient livelihoods focusing on agriculture and use of indigenous knowledge (Forsyth,2017). This usually goes along with the climate vulnerability and capacity analysis. In this paper, we have reviewed and discussed the case study of Vietnam, Africa and India. Good models and practices, in addition to meeting the needs of the community and helping the community respond to climate change, should be aligned with local, regional and national policies, strategies and priorities and with the support of the authorities at all levels.

Keywords: Climate Change, Indigenous Knowledge, Vulnerability, adaptation strategies, Sustainable development

Role of micronutrients in flower crops and their deficiency symptoms

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ABSTRACT: Proper plant nutrition is crucial for the successful production of floricultural crops both in open and protected environments. There are 17 essential elements for plant growth, eight of which are micronutrients (Zinc, Boron, Iron, Manganese, Molybdenum, Copper, Chlorine, Nickel) that are as important as macronutrients for their proper growth and development. The balanced application of nutrients influences quality, which is one of the most important characteristics in the floriculture industry. Integrated supply of micronutrients with macronutrients in adequate amount is one of the most important factors that control plant growth in flower crops. Micronutrients play a peculiar role in every metabolic and cellular function. These elements are active, making them necessary as catalytically active co-factor of enzymes; others stimulate enzymes; and still others play a structural role in protein stabilisation. Increased photosynthetic and other metabolic activities related to cell division and elongation could explain improved growth characteristics as a result of micronutrient application. These micronutrients behave differently under various soil conditions, and some soil conditions may convert these micronutrients to an inaccessible form, affecting flower yield & quality. Deficiency symptoms of Boron are observed on terminal buds. Young leaves show deficiency symptoms of Copper, Iron and Manganese, while old leaves show deficiency symptoms of Zinc and Molybdenum. Chloride and Nickel deficiency symptoms are not so prominent in flower crops. Micronutrients are gaining popularity among flower growers due to their beneficial nutritional support while also ensuring a higher harvest and return. The concept of micronutrient insurance application may be economically utilised in flower crops, particularly where crop needs have not been determined. The increased demand for flower production will necessitate a thorough understanding of the relationship between micronutrients and crop growth. There is little information available about the significance of micronutrients in flower crops.

Keywords: Flower crops, Micronutrients, Quality, Yield.

Chemical and non-chemical means for induction of flowering and yield of mango cv. Alphonso

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ABSTRACT: Mango cv. Alphonso is established on more than 90 per cent of area in Konkan region of Maharashtra. Early flowering is for early harvest which assures premium rate in market. In recent years climatic aberrations such as delayed rains especially during initiation of flowering in month of September and October results in production of vegetative shoots in November instead of flowering panicle. In spite of paclobutrazol application this new flush take another 80 – 100 days to get mature to induce flowers. Hence, flowering is considerably delayed till January. The delayed flowering further delay fruit development and harvesting. The late harvested fruits often trapped in early rains and fetches low market price. Hence, the investigation was attempted to study the utility of removal of newly emerged shoots, foliar application of PBZ and Ortho-phosphoric acid for induction of early flowering. A field trial was conducted twice (2018-19 & 2019-20) in Randomized Block Design with three replications and seven treatments, viz. T₁ (Removal of new shoots), T₂ (Removal of old shoot below new shoots), T₃ (Foliar application of PBZ @ 500 ppm), T₄ (Foliar application of PBZ @ 1000 ppm), T₅ (Foliar application of Ortho-phosphoric @ 0.5 %), T₆ (Foliar application of Ortho-phosphoric @ 1 % ppm) and T₇ (Control). The removal of new shoots (T₁) induced early flowering which led to early harvest by one month as compared to control. It also improved yield without affecting physico-chemical composition.

Keywords: Alphonso, chemical and non-chemical means, yield.

Identification and documentation of indigenous agricultural tools and implements of the Angami tribe, Nagaland, India

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ABSTRACT: Nagaland, one of the states of the North- East India is basically a state with constructive agro-climatic conditions and prosperous bio-diversity of Plants and animals. There are 17 recognized tribes in Nagaland where Angami tribe is one of the major tribe of Nagaland. The Angami tribes, besides other Naga tribes, possess spectacular wealth of indigenous knowledge. Since time immemorial farmers have been practicing traditional method of agriculture. Therefore, research was conducted with the objective to identify and document the Indigenous tools and implements used in Agricultural fields by the Angami tribe of Nagaland, India and to determine the extent of its usage. It was conducted under two blocks of Kohima district whereby a sample size of 120 respondents were randomly considered from two villages of each block respectively. The descriptive research design was followed for the study. Through the study, sixteen (16) different indigenous tools and implements of the Angami tribe used in agricultural activities were identified. It was found that almost all the tools and implements had a touch of bamboo. The identified species used for making them are *Dendrocalamushamiltonii* and *Melocannabaccifera*. The study also found that more than 90 per cent of the respondents were medium to high users of these identified ITK.

Keywords: Indigenous, Technical, Knowledge, Tools, Implements, Angami, Nagaland

Effect of drying methods on physico-chemical and functional properties of Chitosan

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ABSTRACT: Chitosan is a versatile biopolymer obtained by deacetylation of chitin, which is found in shell of shrimp and crustaceans. It has wide application in food, pharmaceutical, textiles and effluent treatment etc. Generally, chitosan is dried by sun drying and it is a time-consuming process. Hence, improved drying process of chitosan is needed for the Industry to speed up the drying process without affecting its properties. Present study focused to determine the drying time and to assess the properties of chitosan under various drying methods. Chitosan was prepared from Industrial chitin (shrimp shell) by cold process and subjected to different drying methods viz., microwave, Infrared, electrical drying, vacuum drying and sun drying. Physico-chemical and functional properties of chitosan were analyzed. Lowest drying time (30-35min) achieved for chitosan processed under 1000watts and Infrared drying than sundried one (120min). Viscosity of the chitosan varied from 953cP-1856cP. Degree of deacetylation ranged from 72.21%- 74.80%. Highest L^* value (74.70), lower a^* (2.02) and b^* (16.42) value obtained for sundried chitosan. Highest water binding and fat binding capacity observed for chitosan dried under microwave. Results suggested that chitosan dried under microwave and Infra-red process could reduce the drying time of chitosan with improved functional properties.

Key words: Chitosan, cold process, drying, properties

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Dr. Devi Dayal is former Head, ICAR- Central Arid Zone Research Institute, Regional Station, Gujarat. He started Agricultural Research Service in January 1984 and has worked in different capacities in technology development and dissemination related to groundnut and other dryland crops for about 36 years in different institutes such as Directorate of Groundnut Research, Junagadh. He was instrumental in developing paired row planting pattern and in-situ moisture conservation technologies for groundnut and other dryland crops. During his career, he mobilised external funding from different agencies such as PPV&FRA, NATP, NAIP and NASF for various research activities and handled collaborative projects with international CGIAR institutions like ICRISAT, Hyderabad & ICARDA, Jordan. He conducted many national seminars in the capacity of organising secretary. He has edited 15 books and published more than 100 research papers in journals of national and international repute. He has also contributed to several book chapters to books and proceedings of the symposia apart from many technical bulletins and training manuals. He has received many awards including Fellow 2015 by the Indian Society of Oil Seeds Research and Gold Medal and Distinguished Plant Scientist Award-2013 by the Academy of Plant Sciences. He serves as member of Editorial Board for Indian Journal of Oil Seeds Research and Advances in Plant Sciences. He acts as external examiner for post-graduate and doctoral students for several universities Junagadh Agricultural University, Junagadh and MPKV, Rahuri, TNAU, Coimbatore and Osmania University, Hyderabad.

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