



Diversity and potentials of legume crops in tribal Tehsils of Khandesh region (Maharashtra: India)

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ABSTRACT

The present author investigated agrobiodiversity, utility and potentials of legume crops in tribal tehsils of Khandesh region of Maharashtra (India) in view of household food security and the socio- economic characteristics. Total nine legume species along with their varieties belonging to six genera are recorded in the region. The perceptions of tribals are noted carefully during field studies on farm, house and local markets. Related history of introduction of crops worldwide and India; apart from their origin, is provided. Nutritional values and traditional utilities are also comparatively presented to point out hidden potentiality.

Key Words: Agrobiodiversity, Legumes, Food Security, Khandesh

1. INTRODUCTION

Nearly 70% of the world's food is derived from just nine crops viz., rice, wheat, maize, barley, potato, cassava, soybean, oats and sugarcane (Ewel *et al.*, 1999). Only three crops species viz., rice, wheat and maize provide about 50% of the global requirement for protein and carbohydrates (Jaenicke and Hoschle-Zeledon, 2006). Mankind utilized nearly 5000 plant species worldwide to suffice nutritional and other requirements. In modern times, just 150 plant species are significant to meet his needs for food. Only about 20-30 plant species are mostly emphasized (Harlan, 1975, Bermejo and Leon, 1994). India stands seventh in world as far as contribution to agrobiodiversity. It is the homeland of 167 cultivated species and 320 wild relatives of crop plants. Although so, food security is still a problem in India for various reasons. At this backdrop, the present authors surveyed agrobiodiversity especially in tribal dominated Khandesh region. The tribes such as Pawara, Kokani, (Kokana) Mavachi, Bhil, Tadvi., etc depend partly on agricultural lands and partly on forest produce. The leguminous crops, a segment of this survey, is being communicated in this paper from the perspective of it agrobiodiversity, utility, and potentials.

2. MATERIALS AND METHODS

Various tribal tehsils were visited during May 2008 to September 2016. The tribal farmers were interviewed *w.r.t.* crop sown, part used, local varieties, uses, names and perceptions. Plants were identified using district, regional and state floras and encyclopedia (Patil, 2003, Kshirsagar and Patil, 2008; Cooke 1958; Bailey, 1949, 1963). Information as obtained from the tribal farmers is presented for each crop species and their local varieties.

3. RESULTS

(1) *Vigna cylindrica* (L.) Eseltine (Fabaceae) Chawali:

Cultivars of Cowpea

(i) Cultivar: Khutali

a) Cultivated in kharif season in Nawapur, Shahada, Nandurbar, Shirpur and Taloda tehsils as a sole crop or intermixed with pigeon pea, sorghum and groundnut crops b) suitable to poor soil and rain fed areas c) nutritious, largely preferred in the area also popular variety in non-tribal area d) seeds and crop plants small sized (dwarf) hence the name 'Khutali' e) green immature pods used in the preparation of vegetable f) boiled seeds consumed or used to prepare vegetable g) seeds are used for 'dal' preparation and also for cattle feed h) green foliage used as fodder.

(ii) Cultivar : Bhaduri, Badari

a) Cultivated in kharif season in Nawapur and Sakri tehsils in agricultural fields having black fertile soil, poor soil not suitable for it b) requires heavy rainfall also planted along with the field margins and near hedges c) matures in month of 'Bhadrapada' (a month in Hindu/ Marathi calendar hence the name Bhaduri, Bhadari).

(iii) Cultivar : Shirpuri

a) Cultivated in kharif season in Raver and Yawal tehsils b) suitable for low fertile soil in hilly areas of the region c) cultivated mostly as a sole crop, require less rain water d) an early blooming variety.

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(iv) Cultivar : Kalichawali

a) Cultivated in kharif and rabbi seasons in Shirpur, Shahada, Nandurbar, Chopda, Sakri and Taloda tehsils as a sole crop b) requires heavy watering and black, fertile soil c) late blooming variety with good market value d) mostly used for preparation of dehusked grain (Dal) e) pods blackish to brown colour hence the name 'Kalichawali'.

(v) Local Shiwali, Shawali

a) Cultivated in kharif season in Raver and Chopda tehsils as a sole crop and as a intercrop in sorghum, pigeon pea, ground nut crops, etc. b) suitable for less fertile soil and in hilly area, drought resistant.

(vi) Cultivar : Mungchawali a) Cultivated in kharif season in Raver and Chopda tehsils b) cultivated in black, fertile soil c) early blooming variety d) The crop ready along with Mung bean hence the name Mungchawali e) seeds nutritious used for curry preparation.

(vii) Cultivar : Safed chawali

a) Cultivated in kharif season in Dhadgaon and Shahada tehsils in agricultural field margins , on waste places around the hamlets, also near hedges b) late blooming variety ,requires heavy rainfall c) good fodder value. d) good market value.

(viii) Cultivar : Mothichawali

a) Cultivated in kharif season in Sakri and Nawapur tehsils as a intercrop with sunflower, sesame, pearl millet, finger millet and maize crops b) requires well fertile soil and heavy irrigation c) cultivated in plain area of the region d) late blooming variety e) mostly used for dal (dehusked grain) preparation.

(ix) Cultivar : Deshichawali a) Cultivated in kharif season in Taloda, Shirpur and Chopda tehsils b) suitable for all types of soil and drought resistance suitable for hilly areas c) seeds nutritious , used for curry and other preparations d) green\ tender pods largely used as vegetable e) good fodder value.

(2) *Vigna radiata* (L.) Wilczek. (Fabaceae) Mung, Mungda:

Cultivars of Mung Bean (Green Gram)**(i) Cultivar : Mung**

a) Cultivated in kharif season in all tribal tehsils as sole crop b) requires fertile soil. c) whole grains (seeds) used for curry and 'dal' preparation, as also for other food preparation d) immature pods used as vegetable e) harvested crops used as fodder and manure preparation f) good market value.

(ii) Cultivar : Dogodya Mung

a) Cultivated in kharif season in Sakri, Nawapur, Shahada, Nandurbar and Chopda tehsils as mix crop in groundnut sorghum & pearl millet b) suitable for all type of soil, drought resistant variety c) late blooming variety d) mostly cultivated for green fodder for cattle, cherished by cattle.

(3) *Vigna mungo* L. (Fabaceae) Udadi, Udid:

Cultivars of Black Gram**(i) Local Cultivar : (Anonymous)**

a) Cultivated in kharif season in Shahada, Nawapur, Shirpur, Taloda, Chopda and Nandurbar tehsils as sole b) requires fertile soil and good rainfall c) seeds used to prepare 'dal'(local vegetable d) 'Dal'(pulse) used for curry and 'Papad' preparation e)) harvested crop used for fodder for cattle, a good fodder value.

(ii) Cultivar : (Anonymous)

a) Cultivated in kharif season in Dhadgaon, Yawal, Sakri, and Shirpur tehsils b) suitable for poor soil, drought resistant variety c) used for 'dal' preparation d) 'Dal(pulse)' used for curry and 'Papad' preparations e) harvested crop used for fodder for cattle, good fodder value.

(4) *Cajanus cajan* (L.) Millsp. (Fabaceae) Tur, Turi, Tui:**Cultivars of Pigeon Pea****(i) Cultivar: Gawaran Variety-I (Anonymous)**

a) Cultivated in kharif season in Chopda, Nawapur, Akkalkuwa and Dhadgaon tehsils. In Nawapur tehsil, this crop extensively cultivated as a sole crop or as intercrop with rice, maize, soybean, sorghum and cowpea, etc b) suitable in all types of soil c) drought resistant, requires less rainfall suitable for hilly area d) seeds used for 'dal' preparation (local vegetable) e) green immature, mature seeds used for curry preparation f) green twigs, leaves (green and dry) used as fodder g) stem, root stocks are used as domestic fuel h) stems used to prepare partition walls, compartments in the house, for roof making and also for broom making.

(ii) Cultivar: Gawaran Variety-II (Anonymous)

a) Cultivated in kharif season as intercrop with groundnut, cowpea, sorghum, bimlijute etc. in Shirpur, Yawal, Raver and Nandurbar tehsils b) requires well fertile soil and good irrigation c) seeds cooked, eaten raw or used to prepare curry and 'dal'.

(iii) Cultivar : Gawaran Variety-III (Anonymous)

a) Cultivated in kharif and rabbi season in Yawal, Raver, Shahada, and Shirpur tehsils as a sole crop b) requires fertile, black soil where irrigation facilities available c) good market value d) seeds used to prepare dal. Seeds, dal used for various food preparations.

(5) *Cicer arietinum* L. (Fabaceae) Chana, Harbhara**Cultivars of Chickpea Gram**

a) Cultivated in kharif season in Chopda, Yawal, Shirpur, Dhadgaon, Nandurbar, Shahada, Taloda and Sakri tehsils b) grows in all types of soil. In black fertile soil, yield is more than one in poor soil, in sandy poor soil, crop requires irrigation c) leaves and tender branches used as vegetable, to prepare curry along with jaggery and jujube d) seeds used for preparation of pulse (Dal), dal flour used for various preparations, seeds used to prepare curry or for other food preparations e) tender branches along with leaves are sundried and stored, used as vegetable throughout the year f) good market value g) harvested crop used as fodder for cattle.

(6) *Dolichos uniflorus* Lam. (Fabaceae) Kudid, Kulith :**Cultivars of Horse Gram**

a) Cultivated in kharif and rabbi season in Akkalkuwa, Nawapur and Sakri tehsils b) grows in all types of soil c) drought resistant and requires less rainfall d) seeds cooked and eaten like rice or used to prepare curry e) harvested crops used for fodder, majority of tribals use the seeds to prepare cattle feed.

(7) *Lens culinaris* Medic. (Fabaceae) Mathur, Masur:**Cultivars of Lentil**

a) Cultivated kharif and rabbi season in Sakri, Nawapur, Shahada and Akkalkuwa tehsils b) requires less duration for about 1.5-2 months c) drought resistant needs no irrigation d) grows in all types of soil. In black fertile soil gives good yield e) seed used as staple food, cooked and consumed like rice, used to prepare 'dal' (dehusked grain) f) sprouted seeds used to prepare curry or used in other food preparations g) good market value, surplus yield sold in market h) harvested crop used as fodder.

(8) *Vigna aconitifolia* (Jacq.) Morechal (Fabaceae) Math, Matki :**Cultivars of Moth Bean Dew bean**

a) Cultivated in kharif season in Raver, Yawal, Sakri, Shirpur, Shahada and Akkalkuwa tehsils as intercrop in sorghum, pearl millet, pigeon pea etc crops b) suitable for all types of soil e) seeds used to prepare curry and 'dal' preparation d) good market value e) harvested crop used as fodder, good fodder value .

(9) *Lablab purpureus* (L.) Sweet (Fabaceae), Walkhada, Wal:

Cultivars of Lablab Bean

a) Cultivated in kharif season as sole crop in plain areas of Nawapur, Sakri and Nandurbar tehsils b) require good fertile soil c) seeds used to prepare dehusked grain (Dal) d) seeds sold in market e) harvested crop used for fodder for cattle f) other cultivars of it found in homestead gardens of the tribals.

4. DISCUSSION

(i) Cowpea [*Vigna cylindrica* (L.) Eseltine]: Its primary centre of origin is Africa. It is one of the major food cultures in these regions. It is usually grown as a mixed or inter-crop (Kumar and Singh, 2004; Swamy and Sadashiva, 2007). It is cultivated in West Africa, India, Central America, South-east, Asia and Carribean area. Many cultivars have been developed in South East Asian countries. The largest collection of cultivars is found of IITA in Ibadan, Nigeria, India and USA (Grubben, 1977). Cultivated cowpea is originated in Africa and then reached to Egypt or Arabia to Asia and Mediterranean regions. It was introduced in West Indies in the 16th century by Spaniards and in America about 1700 AD. In India, it is grown in northern and southern states. It was domesticated over 4000 years ago in India.

The cultivars shows diversity *w.r.t.* growth habit, leaf shape, flower colour, male sterility, high protein, size and colour of seeds, tolerance to pests and drought, grain yield, duration, etc. (Swamy and Sadashiva, 2007). Many hybrids have been released in USA, Nigeria, Rome and India. The present investigators observed total nine cultivars/landraces in Khandesh. Cowpea seeds contain protein, fat, carbohydrates, minerals (calcium, phosphorus, potassium, iron), and vitamins A, B6, B12, C, thiamine, and riboflavin (www.infonet.biovision.org). It is ancient source of legume food, fodder and vegetable. Pods, seeds and leaves are also used as vegetable when they are tender. (Kumar and Singh, 2004; Swamy and Sadashiva, 2007).

(ii) Green Gram [*Vigna radiata* (L.) Wilczek] : Since ancient times, green gram had been grown in India and Nile Valley (De Candolle, 1886). Vavilov (1926) also thought India as 'centre of origin of cultivation. However, Zuckovskij (1962) considered *Phaseolus sublobatus* growing wild in India, as the progenitor of green gram. Prain (1903), Piper and Morse (1914) lent support to such a derivation of green gram. It is widely found under cultivation in India, Pakistan and Burma. It has extended to China, Iran, Japan, Nigeria, Ghana, West Indies and USA. In India, it is grown in Rajasthan, Maharashtra, Karnataka, Andhra Pradesh, Orissa, Bihar and Tamil Nadu as kharif and rabi crop.

Breeding programmes in India started since 1925 evolving a plant type with erect habit, short duration, high yield, synchronized maturity of pods, non-shattering habit, bold and shining seed with good cooking qualities. A large number of improved varieties are released (Majumdar, 2011). Recently, AICRP developed 13 varieties suitable for cultivation in different states in India. Two varieties are met with in Khandesh region.

Seeds contain protein, carbohydrates, fat, fiber, minerals (calcium, phosphorus, iron), thiamine, nicotinic acid, niacin, riboflavin, vitamin A & C, etc. (www.infonet.biovision.org). Mung dal (split pulse) is consumed as porridge or soup. Sprouted grains are cooked as a curry. It is used in snacks, noodles, papad and sweetmeats.

(iii) Black Gram [*Vigna mungo* (L.) Hepper] : De Candolle (1886) and Vavilov (1926) thought India as a primary centre of its origin. Zuckovskij (1962) considered *Vigna sublobatus* as the progenitor of blackgram which grows wild in India. Vedic literature e.g. CharakSanhita, Kautilya's Arthashastra, are replete with reference to blackgram (www.infonet.biovision.org). It is grown in various regions of Asia and Africa.

In India, it is grown in majority of states. Improvement programme of blackgram started in 1943 in different states under ICAR suitable to grow in different seasons. Varieties have been evolved putting emphasis on high yield, short duration, non-shattering habit, resistance to pests and diseases, good cooking qualities and high protein content. In Khandesh, two varieties are grown.

The seeds contain protein, fat, carbohydrate, fibre, minerals (calcium, phosphorus, iron), vitamin - A, carotene, thiamine, riboflavin, niacin, etc. (www.infonet.biovision.org). It is rich in protein and used in the form of dal (split pulse) or flour in preparing papad, dosa, idli, etc.

(iv) Pigeon Pea [*Cajanus cajan* (L.) Millsp.]: It is undoubtedly proved that India is a primary centre of origin of cultivated pigeon pea. Vavilov (1939) concluded it so based on the presence of high diversity among landraces. De (1974) and Maesen (1980) lent support to this standpoint and thought that it was taken to Africa nearly 4000 years ago. It came to the American continent by means of the

slave trade (Carney and Rosomoff, 2009). Its cultivation goes back 3500 years. Archaeological findings from Neolithic sites in Odisha (Gopalpur and Golbai) and South India (Sangarakullu and Tuljapur) dating back 3400-3000 years ago supports the Indian origin of the crop.

Presently, it is cultivated in all tropical and semitropical regions of the Old and New Worlds. It is important legume crop of rainfed agriculture either as a sole crop or intermixed with cereals. Various notable traits of cultivated pigeon pea are pod length and color, seed size and colour. However, in recent times, the major objectives for cultivation of this crop are early podding round – the- year flowering and fruiting, dual purpose varieties, high multiple- harvest pod yield, long green pods with fully grown ovules, large attractive seeds with good taste, long shelf-life of pods and seeds, etc. ICRISAT Gene bank has 13548 germplasm accessions from 76 countries (Gowda *et al.*, 2011).

The present survey in Khandesh recorded 03 varieties cultivated by the tribal farmers. It contains protein, fat, carbohydrate, vitamins (thiamine, riboflavin, niacin, pantothenic acid, vitamin B6, folate (B9), chlorine, vitamin (E and K), mineral elements (calcium, phosphorus, potassium, iron, magnesium, sodium, zinc, etc) (*cf.* Bressani *et al.*, 1986; Gowda, 2011).

Pigeon pea is useful as food crop and fodder crop. Green or dry seeds find place in various food preparations. Sprouted seeds are also cooked. In India, split pigeon peas (tur dal) is the most popular pulse in vegetarian diet *viz.*, dal and sambar. In Ethiopia, pods, young shoots and leaves are consumed (*cf.* Zemedu Asfaw, 1995). It is used as stew and porridge. It is used as either fresh, frozen or canned vegetable (Gowda *et al.*, 2011). In Khandesh, it is used to prepare vegetable and 'varan' and in various local preparations. Pods, after boiling in salted water, are consumed (present study). Some aromatic varieties of pulse of *Cajanus cajan* L. are well known from Navapur Tehsil of Nandurbar District. This has been particularly noticed recently by Geographic Indication Centre, New Delhi. These varieties should be promoted on large scale to benefit tribal farmers. It is one of the most nutritionally rich vegetable and a choice of many Indians.

(v) Chickpea OR Gram [*Cicer orientinum* L.]: Chick pea materials were found in excavation at Hachilar in Turkey about as early as 5450 B.C. This, in opinion of Helbeck (1970), is indicative of a fact that chickpea was consumed by man during Neolithic period. Chaudhary *et al.* (1971) informed its earliest record in India in Atranji Khera in Uttar Pradesh dating back to 2000 BC. De Candolle (1886) thought area between Greece and Himalayas as the place of origin. Vavilov (1926) suggested two centers of diversity, one in the southwest Asia and Mediterranean and second in Ethiopia. It is now being grown in India, Pakistan, Ethiopia, Myanmar and Turkey. The maximum production and area of cultivation is from India.

In India, it is cultivated in majority of states belonging to all four zones *viz.*, East, West, South and North. A large number of varieties have been developed by each state by selecting seed coat features, size, early maturity, tolerance, high yield, seed weight, etc.

It contains protein, fat, carbohydrate, fibre, minerals (calcium, phosphorus, iron, magnesium, potassium), carotene, vitamin A & C, thiamine, riboflavin, niacin, etc. (www.infonet.biovision.org). Seeds of chickpea are used as dal (split pulse) or as a whole. It is consumed as ripe or unripe or sprouted. Its flour is used in sweet preparations. It is also consumed roasted or water soaked (Majumdar, 2011).

(vi) Horse Gram [*Dolichos uniflorus* Lam.] It is thought probably originated in Southeast Asia. Peninsular India is more probable area since important forms occur therein. It is mostly grown in the tropical region of the Old World. India is the major country of its production. (Majumdar, 2011). It is widely grown in Maharashtra, Karnataka, Odisha, Tamil Nadu, Andhra Pradesh, Madhya Pradesh and Chhattisgarh. Improved varieties suitable to different agro-climatic zones have been developed by selecting characters like short duration, plant habit, colour and size of grains.

It contains protein, fat, carbohydrates, fiber, minerals (calcium, iron, phosphorus), vitamin-A, carotene, thiamine, riboflavin, niacin, etc. (Gopalan *et al.*, 1977). It is mostly used for human consumption after boiling, roasting and salted or in the form of soup. It is also a good animal feed. Dal (split pulse) is cooked.

(vii) Lentil [*Lens culinaris* Medic.]: Lentil was first cultivated in Greece and Italy during early pre-historic times and then introduced in Egypt more or less in the same period. It then spread east and west. Its introduction dates back to ca 2000 B.C. in the Indo-Gangetic plains. Possibly it may have been introduced even earlier with the arrival of Aryans as suggestive from the contacts between Mohenjo-Daro and the Sumerians and Akkadians of Mesopotamia (Anonymous, 1962; Kochhar, 1981; Kumar *et al.*, 1982-

83; Zohary, 1972). Presently, it is concentrated more in northern states of India and rarely in southern India. It is a crop of minimum rainfall and less fertile lands, In Maharashtra, it is rarely cultivated.

Negi *et al.* (2000) characterized and evaluated 497 accessions for 30 qualitative and quantitative traits at Regional Station Bhowali (District Nainital : Uttar Pradesh, India). They scored both morphological and agronomical attributes such as number of branches, seed size, number of clusters per plant, pigmentation and length of pod, flower colour, seed colour, number of days to flower and maturity, net yield per plant, leaflet size, tendril length, etc. They concluded that such variability is of interest to the breeders in crop improvement. Varietal improvement work begun in India in 1924 with collection of local strains. Many varieties have been developed for different states of India under AICRP (All India Coordinated Pulse Improvement Project). In India, two types viz. bold seeded and small seeded are recognized. The former is grown in central zone /while the latter in the Indo-gangetic plains. It contains protein, fat, carbohydrate, fibre, minerals (calcium, phosphorus, iron, magnetism, potassium), carotene, vitamin A, thiamine, riboflavin, niacin, etc. (Majumdar, 2011; Nezamuddin, 1970). Lentil is consumed as 'dal' (split pulse) and whole grains. It is a good green fodder.

(viii) Moth Bean [*Vigna acontifolia* (Jacq.) Morechal]: De Candolle (1886) recorded it wild in India. Vavilov (1926) informed wild and cultivated forms under Indian centre of origin. It is cultivated as a crop only in India and wild forms also occur in India and Srilanka (Piper and Morse, 1914). There are records indicative of a fact that the original home of mothbean is India. It is found in wild state from the Himalayas in the north to Sri Lanka in the south and also in Pakistan, Myanmar and Thailand. Its cultivation is concentrated in north-western desert region adjoining Indo- Pakistan border. It is being grown outside India in Burma, southern China, Malaysia and recently introduced in U.S.A.

Still improved varieties have been released suitable to different states in India. Some promising varieties viz., Baleshwar 12, G moth 1, Jadia, Jawel, Type 1 and No.88 have been developed emphasizing characteristics like maturity period, chocolate colour, seed weight, resistance to yellow mosaic virus, shining seeds and green fodder yield, etc. (Majumdar, 2011).

The seeds contain protein, fat, fiber, carbohydrate minerals (calcium, phosphorus, iron), vitamin A and C, carotene, thiamine, riboflavin, niacin, etc. (Majumdar, 2011; Gopalan *et al.*, 1977). It is mainly used as 'dal' (split pulse). Germinated seeds are cooked. It is a good source of fodder.

(ix) Lablab Bean [*Lablab purpureus* (L.) Sweet]: Total six varieties of *Lablab purpureus* (L.) Sweet is found under cultivation in this region. Other five varieties are in vogue as fruit vegetable.

5. CONCLUSIONS

The present authors compared the results obtained during their own investigation with earlier authentic literature. After critical comparison, they focused clearly the similar utilities and also pointed out additional utilities in vogue in Khandesh region Apart from these, some suggestions for people of Khandesh region are made. They are presented in the following crop-wise.

(i) Cowpea : Use of green and mature seeds, besides tender pods is recorded by the present investigators in Khandesh. The mature foliage is fed to cattle. Tender leaves can be also used as vegetable as reported earlier. They can be adapted for the same purpose. Tribals of Khandesh should be made aware of this fact. It will add a source of vegetable.

(ii) Green Gram: Similar food habit is noted. Plants constitute a good fodder for cattle.

(iii)Black Gram : More a less similar uses are noted. However, in tribal area it is used as 'dal' (vegetable and papad).

(iv) Pigeon Pea : Short duration improved varieties suitable for rainfed agriculture may be advised for tribal farmers of Khandesh

(v) Chick Pea Or Gram: All these uses are observed. Green leaves are used as vegetable.

(vi) Horse Gram : Dal (split pulse) is cooked and eaten with rice. The seeds are mainly used to prepare animal feed. Harvested crops are used as fodder.

(vii) Lentil : It is used similarly .It is protein-rich and interestingly it is cultivated mostly by the tribal farmers in Khandesh. Its high-yielding varieties should be advised for all.

(viii) Moth Bean: It is used similarly.

(ix) Lablab Bean : One of its variety viz., White-seeded local 'walkheda' is but cultivated as legume crop in this region. It is particularly used as pulse in this region.

SUMMARY OF RESEARCH

During our investigation 09 legume crops are studied particularly to reveal hitherto undocumented utilities *vis- a- vis* the potentialities in our area of research. Practically each legume crop has its own indigenous utilities. These newer potentialities also may be put in use by other societies. The extension will thus add a method of adding protein- rich food. This may also help minimize the problem of malnutrition. Utilities and potentialities recorded in other regions or countries can be also adopted by local people of Khandesh which may benefit them also as stated earlier .This paper substantially add to the knowledge of food science and other miscellaneous utilities.

FUTURE ISSUES

Experimentation on food crops are not standstill. For better upliftment, newer varieties are being experimented worldwide; their revelation should be analyzed critically to suit changing life pattern in tribal as well as rural region in Khandesh region, as also in other Indian societies.

DISCLOSURE STATEMENT

Some new utilities and employment by people of Khandesh region if suitable for life pattern of other countries should be adopted with some variations if necessary. Indigenous utilities are generally time –tested and hence fit for better upliftment in other human societies also.

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