In [5]:

```
from pathlib import Path
import os
import pandas as pd
import numpy as np
from sklearn.metrics.pairwise import cosine_similarity
from operator import itemgetter
from matplotlib import pyplot as plt
from sklearn.preprocessing import StandardScaler
from sklearn.metrics.cluster import adjusted_rand_score
from sklearn.decomposition import PCA
import matplotlib.image as mpimg
import cv2
pd.set_option('display.max_columns', 500)
```

In [14]:

```
fname=[]
imgall=[]
for filename in os.listdir(r"./meetfresh"):
    fname.append(filename)
    img=cv2.imread(r"./meetfresh/"+filename)
    b,g,r = cv2.split(img)
    rgb_img = cv2.merge([r,g,b])
    plt.imshow(rgb_img)
    plt.xticks([]), plt.yticks([])
    plt.show()
    imgr=cv2.resize(img, (800,800), interpolation = cv2.INTER_AREA).flatten().tolist()
    imgall.append(imgr)

imgall=np.matrix(imgall)/255
print(fname)
print(imgall.shape)
```

In [15]:

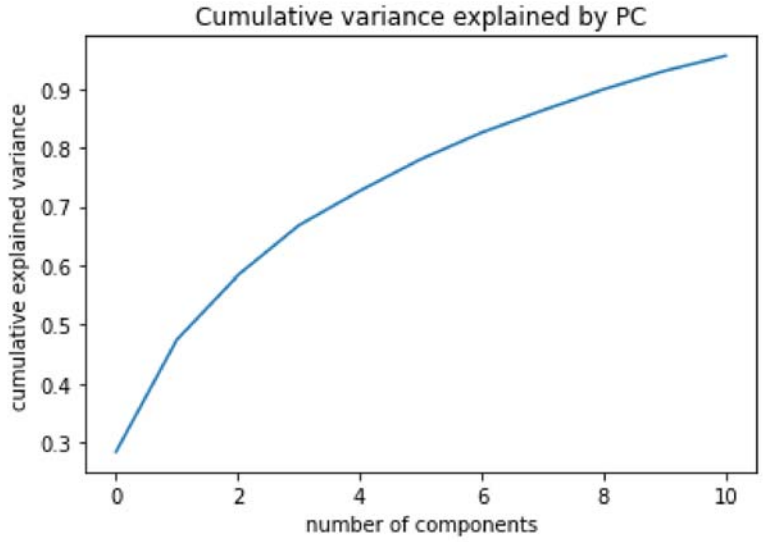
```
n_components = 0.95
pca = PCA(n_components)
pimg = pca.fit_transform(imgall)
```

In [16]:

```
# plot cumulative variance explained
plt.plot(np.cumsum(pca.explained_variance_ratio_))
plt.xlabel('number of components')
plt.ylabel('cumulative explained variance')
plt.title('Cumulative variance explained by PC')
```

Out[16]:

```
Text(0.5, 1.0, 'Cumulative variance explained by PC')
```



In [27]:

```
np.set_printoptions(edgeitems=30, linewidth=100000,formatter=dict(float=lambda x: "%.3g" % x))
pimg
```

Out[27]:

```
array([[-182, -60, -26.3, -3.32, -40.7, 34.4, -79.4, -39.6, 10, -11.3, -44.1],
       [-186, -63.2, -11.6, 15.2, -25.7, 25.4, -103, -24.3, 30.1, -30, -14.6],
       [-143, 22, 88.8, 92.7, 53.7, -15.7, 16.6, 33.7, -5.97, -17.2, 169],
       [-168, 0.424, 150, -22.8, 127, -95.8, -18.5, 35.3, -99.5, 118, -63.2],
       [-153, -264, -128, -3.68, -10.5, -88.6, 139, 0.276, 42.9, 11.4, -24.4],
       [202, -57.1, -121, -139, -37, 65.3, -43.6, -0.778, 42.1, 161, 67.5],
       [86.3, 87.5, 86.3, -92, 158, 54.8, 33.2, 61, 164, -41.7, -40.5],
       [-67.2, 269, -44.4, -95, -102, 88.5, 85.9, -7.37, -60.1, -11.8, -37.8],
       [-183, -174, -72.7, 31.6, -34.6, -4.42, 26.8, -21.5, 27.8, -27, 7.88],
       [240, -53.8, -126, -138, 132, -52, -34.6, -83.5, -96.9, -95.9, 22.5],
       [152, 276, -197, 210, 14.9, -116, -33.9, 5.23, 40.3, 24.4, -24.7],
       [241, -173, 0.215, 40.1, -72.5, 24.3, -49.2, 193, -58.8, -47.2, -25.1],
       [223, -114, 87.4, 199, 49.2, 159, 71.4, -91.4, -36.7, 26.5, -27.2],
       [258, -12.2, 240, -38.4, -145, -139, -1.29, -75.1, 47.2, -12.6, -0.519],
       [-49.6, 157, 25.1, -26.3, -36.2, 11.9, 77.3, 33, -37.4, -20.6, 41.1],
       [-106, 94.8, 4.84, -43, -19.9, -5.29, 46.2, 10.3, -19.4, -8.23, -9.01],
       [-166, 63.4, 43.9, 13, -10.6, 53.4, -132, -28.5, 10.5, -17.2, 3]])
```

In [28]:

```
cosine_sim=cosine_similarity(pimg,pimg)
cosine_sim
```

Out[28]:

```
array([[1, 0.969, 0.157, 0.257, 0.416, -0.349, -0.416, -0.00671, 0.75, -0.457, -0.40
6, -0.386, -0.396, -0.509, -0.188, 0.295, 0.745],
       [0.969, 1, 0.311, 0.25, 0.367, -0.405, -0.349, -0.127, 0.738, -0.474, -0.381,
-0.35, -0.399, -0.483, -0.216, 0.224, 0.796],
       [0.157, 0.311, 1, 0.373, 0.03, -0.538, -0.0998, -0.0957, 0.253, -0.487, -0.13
7, -0.362, -0.142, -0.25, 0.338, 0.297, 0.422],
       [0.257, 0.25, 0.373, 1, 0.0801, -0.436, -0.0171, -0.0842, 0.0825, -0.323, -0.
313, -0.354, -0.266, -0.149, 0.0835, 0.36, 0.339],
       [0.416, 0.367, 0.03, 0.0801, 1, -0.0738, -0.361, -0.399, 0.87, -0.0951, -0.38
2, -0.0161, -0.147, -0.33, -0.396, -0.0468, -0.224],
       [-0.349, -0.405, -0.538, -0.436, -0.0738, 1, 0.0804, -0.0975, -0.273, 0.473,
0.0464, 0.368, 0.148, 0.178, -0.315, -0.475, -0.456],
       [-0.416, -0.349, -0.0998, -0.0171, -0.361, 0.0804, 1, 0.0555, -0.491, 0.146,
0.0199, -0.0399, 0.0483, 0.145, 0.107, -0.00519, -0.122],
       [-0.00671, -0.127, -0.0957, -0.0842, -0.399, -0.0975, 0.0555, 1, -0.323, -0.2
01, 0.235, -0.443, -0.367, -0.19, 0.852, 0.794, 0.236],
       [0.75, 0.738, 0.253, 0.0825, 0.87, -0.273, -0.491, -0.323, 1, -0.323, -0.457,
-0.161, -0.203, -0.484, -0.338, 0.0601, 0.228],
       [-0.457, -0.474, -0.487, -0.323, -0.0951, 0.473, 0.146, -0.201, -0.323, 1, 0.
115, 0.324, 0.169, 0.182, -0.318, -0.459, -0.53],
       [-0.406, -0.381, -0.137, -0.313, -0.382, 0.0464, 0.0199, 0.235, -0.457, 0.11
5, 1, -0.0393, 0.0368, -0.0219, 0.2, -0.028, -0.15],
       [-0.386, -0.35, -0.362, -0.354, -0.0161, 0.368, -0.0399, -0.443, -0.161, 0.32
4, -0.0393, 1, 0.421, 0.34, -0.429, -0.684, -0.534],
       [-0.396, -0.399, -0.142, -0.266, -0.147, 0.148, 0.0483, -0.367, -0.203, 0.16
9, 0.0368, 0.421, 1, 0.292, -0.376, -0.662, -0.408],
       [-0.509, -0.483, -0.25, -0.149, -0.33, 0.178, 0.145, -0.19, -0.484, 0.182, -
0.0219, 0.34, 0.292, 1, -0.0977, -0.359, -0.372],
       [-0.188, -0.216, 0.338, 0.0835, -0.396, -0.315, 0.107, 0.852, -0.338, -0.318,
0.2, -0.429, -0.376, -0.0977, 1, 0.827, 0.188],
       [0.295, 0.224, 0.297, 0.36, -0.0468, -0.475, -0.00519, 0.794, 0.0601, -0.459,
-0.028, -0.684, -0.662, -0.359, 0.827, 1, 0.448],
       [0.745, 0.796, 0.422, 0.339, -0.224, -0.456, -0.122, 0.236, 0.228, -0.53, -0.
15, -0.534, -0.408, -0.372, 0.188, 0.448, 1]])
```

In [29]:

```
ac=abs(cosine_sim)
ac=np.matrix.round(ac,decimals=2)
ac
```

Out[29]:

```
array([[1,  0.97,  0.16,  0.26,  0.42,  0.35,  0.42,  0.01,  0.75,  0.46,  0.41,  0.39,  0.4,  0.
51,  0.19,  0.3,  0.74],
       [0.97,  1,  0.31,  0.25,  0.37,  0.41,  0.35,  0.13,  0.74,  0.47,  0.38,  0.35,  0.4,  0.
48,  0.22,  0.22,  0.8],
       [0.16,  0.31,  1,  0.37,  0.03,  0.54,  0.1,  0.1,  0.25,  0.49,  0.14,  0.36,  0.14,  0.2
5,  0.34,  0.3,  0.42],
       [0.26,  0.25,  0.37,  1,  0.08,  0.44,  0.02,  0.08,  0.08,  0.32,  0.31,  0.35,  0.27,
0.15,  0.08,  0.36,  0.34],
       [0.42,  0.37,  0.03,  0.08,  1,  0.07,  0.36,  0.4,  0.87,  0.1,  0.38,  0.02,  0.15,  0.3
3,  0.4,  0.05,  0.22],
       [0.35,  0.41,  0.54,  0.44,  0.07,  1,  0.08,  0.1,  0.27,  0.47,  0.05,  0.37,  0.15,  0.
18,  0.32,  0.47,  0.46],
       [0.42,  0.35,  0.1,  0.02,  0.36,  0.08,  1,  0.06,  0.49,  0.15,  0.02,  0.04,  0.05,  0.
14,  0.11,  0.01,  0.12],
       [0.01,  0.13,  0.1,  0.08,  0.4,  0.1,  0.06,  1,  0.32,  0.2,  0.23,  0.44,  0.37,  0.19,
0.85,  0.79,  0.24],
       [0.75,  0.74,  0.25,  0.08,  0.87,  0.27,  0.49,  0.32,  1,  0.32,  0.46,  0.16,  0.2,  0.
48,  0.34,  0.06,  0.23],
       [0.46,  0.47,  0.49,  0.32,  0.1,  0.47,  0.15,  0.2,  0.32,  1,  0.12,  0.32,  0.17,  0.1
8,  0.32,  0.46,  0.53],
       [0.41,  0.38,  0.14,  0.31,  0.38,  0.05,  0.02,  0.23,  0.46,  0.12,  1,  0.04,  0.04,
0.02,  0.2,  0.03,  0.15],
       [0.39,  0.35,  0.36,  0.35,  0.02,  0.37,  0.04,  0.44,  0.16,  0.32,  0.04,  1,  0.42,
0.34,  0.43,  0.68,  0.53],
       [0.4,  0.4,  0.14,  0.27,  0.15,  0.15,  0.05,  0.37,  0.2,  0.17,  0.04,  0.42,  1,  0.2
9,  0.38,  0.66,  0.41],
       [0.51,  0.48,  0.25,  0.15,  0.33,  0.18,  0.14,  0.19,  0.48,  0.18,  0.02,  0.34,  0.2
9,  1,  0.1,  0.36,  0.37],
       [0.19,  0.22,  0.34,  0.08,  0.4,  0.32,  0.11,  0.85,  0.34,  0.32,  0.2,  0.43,  0.38,
0.1,  1,  0.83,  0.19],
       [0.3,  0.22,  0.3,  0.36,  0.05,  0.47,  0.01,  0.79,  0.06,  0.46,  0.03,  0.68,  0.66,
0.36,  0.83,  1,  0.45],
       [0.74,  0.8,  0.42,  0.34,  0.22,  0.46,  0.12,  0.24,  0.23,  0.53,  0.15,  0.53,  0.41,
0.37,  0.19,  0.45,  1]])
```

In [33]:

```
results = []
for i in range(len(fname)):
    similar_items = []
    similar_items=sorted(enumerate(ac[i], start=1), key=itemgetter(1), reverse=True)[1:]
    results.append(similar_items)
results
```

Out[33]:

```
[[(2, 0.97),
  (9, 0.75),
  (17, 0.74),
  (14, 0.51),
  (10, 0.46),
  (5, 0.42),
  (7, 0.42),
  (11, 0.41),
  (13, 0.4),
  (12, 0.39),
  (6, 0.35),
  (16, 0.3),
  (4, 0.26),
  (15, 0.19),
  (3, 0.16),
  (8, 0.01)],
 [(1, 0.97),
  (17, 0.8),
```

In [50]:

```
i=0
img=cv2.imread(r"./meetfresh/"+fname[i])
b,g,r = cv2.split(img)
rgb_img = cv2.merge([r,g,b])
plt.imshow(rgb_img)
plt.xticks([]), plt.yticks([])
plt.show()
```

In [51]:

```
print("Top 5 recommands for %s is"%(fname[i].split(".")[0]))
```

```
Top 5 recommands for Black-Tea-w-Lychee-Jelly is
```

In [53]:

```
for j in range(5):
    print(fname[results[i][j][0]-1].split(".")[0])
    img=cv2.imread(r"./meetfresh/"+fname[results[i][j][0]-1])
    b,g,r = cv2.split(img)
    rgb_img = cv2.merge([r,g,b])
    plt.imshow(rgb_img)
    plt.xticks([]), plt.yticks([])
    plt.show()
```

Black-Tea

Pineapple-Black-Tea

Winter-Melon-Tea

Signature-Icy-Grass-Jelly

Purple-Rice-Soup

In [67]:

```
plt.rcParams['figure.figsize'] = [20, 20]
i=0
print("Top 5 recommands for %s is"%(fname[i].split(".")[0]))
img=cv2.imread(r"./meetfresh/"+fname[i])
b,g,r = cv2.split(img)
rgb_img = cv2.merge([r,g,b])
ax=plt.subplot(1,6,1)
plt.imshow(rgb_img)
plt.xticks([]), plt.yticks([])
ax.set_title(fname[i].split(".")[0],color='red',fontweight='bold')
for j in range(5):
    ax=plt.subplot(1,6,j+2)
    ax.set_title(fname[results[i][j][0]-1].split(".")[0])
    img=cv2.imread(r"./meetfresh/"+fname[results[i][j][0]-1])
    b,g,r = cv2.split(img)
    rgb_img = cv2.merge([r,g,b])
    plt.imshow(rgb_img)
    plt.xticks([]), plt.yticks([])
plt.show()
```

Top 5 recommands for Black-Tea-w-Lychee-Jelly is

In [74]:

```
print("Top 5 recommands")
for i in range(len(fname)):
    #print("Top 5 recommands for %s is"%(fname[i].split(".")[0]))
    img=cv2.imread(r"./meetfresh/"+fname[i])
    b,g,r = cv2.split(img)
    rgb_img = cv2.merge([r,g,b])
    ax=plt.subplot(1,6,1)
    plt.imshow(rgb_img)
    plt.xticks([]), plt.yticks([])
    ax.set_title(fname[i].split(".")[0],color='red',fontweight='bold')
    for j in range(5):
        ax=plt.subplot(1,6,j+2)
        ax.set_title(fname[results[i][j][0]-1].split(".")[0])
        img=cv2.imread(r"./meetfresh/"+fname[results[i][j][0]-1])
        b,g,r = cv2.split(img)
        rgb_img = cv2.merge([r,g,b])
        plt.imshow(rgb_img)
        plt.xticks([]), plt.yticks([])
    plt.show()
```

Top 5 recommands


Hot-Taro-Ball-1
Fluffy-Black-Tea
Purple-Rice-Soup
Traditional-Milk-Tea
Winter-Melon-Tea
Fresh-Milk-Black-Tea-w-Boba
Mung-Bean-Tofu-Pudding
Pineapple-Black-Tea
Black-Tea-w-Lychee-Jelly
Herbal-Teas
Black-Tea
Purple-Rice-Soup
Original-waffle
Soy-Milk
Traditional-Milk-Tea
Red-Bean-Soup
Herbal-Teas
Signature-Hot-Almond-Soup
Pineapple-Black-Tea
Herbal-Teas
Black-Tea-w-Lychee-Jelly
Black-Tea
Mung-Bean-Tofu-Pudding
Signature-Icy-Grass-Jelly
Purple-Rice-Soup
Winter-Melon-Tea
Fluffy-Black-Tea
Black-Tea
Hot-Taro-Ball-1
Black-Tea-w-Lychee-Jelly
Q-Mochi-Egg-Pudding-Combo
Pineapple-Black-Tea
Black-Tea-w-Lychee-Jelly
Black-Tea
Herbal-Teas
Fresh-Milk-Black-Tea-w-Boba
Red-Bean-Soup
Traditional-Milk-Tea
Winter-Melon-Tea
Original-waffle
Soy-Milk
Signature-Hot-Almond-Soup
Signature-Hot-Almond-Soup
Traditional-Milk-Tea
Red-Bean-Soup
Winter-Melon-Tea
Black-Tea-w-Lychee-Jelly
Black-Tea
Signature-Icy-Grass-Jelly
Black-Tea-w-Lychee-Jelly
Black-Tea
Pineapple-Black-Tea
Winter-Melon-Tea
Traditional-Milk-Tea


Soy-Milk
Original-waffle
Traditional-Milk-Tea
Red-Bean-Soup
Herbal-Teas
Signature-Hot-Almond-Soup
Traditional-Milk-Tea
Soy-Milk
Original-waffle
Red-Bean-Soup
Signature-Hot-Almond-Soup
Hot-Taro-Ball-1
Winter-Melon-Tea
Black-Tea
Black-Tea-w-Lychee-Jelly
Purple-Rice-Soup
Red-Bean-Soup
Hot-Taro-Ball-1

In [ ]: